MODERN MEDICAL MONOGRAPHS

Edited by

HUGH MACLEAN M.D. D Sc. F.R.C.P.

MODERN METHODS OF FEEDING IN INFANCY AND CHILDHOOD

IF I WERE KING

If I were King of England,
What lots of things I'd do,
What plans I'd make,
What pains I'd take,
To have things nice for you

First I would issue orders
That, to all sorts and ranks
Of girls and boys,
All sweets and toys
Were sold for 'please" and 'thanks"

Christmas would happen once a month
And birthdays once a week,
And in the schools
They'd teach the rules
Of naught but hide and seek.

Nurses should go to bed at six
However much they'd scream,
And you should dine
At half past nine
On strawberries and cream

And I should have great puddles made
In every single street,
Where you could play
The livelong day
And splash them with your feet

Oh that would be a wondrous time,
For every single thing
That ever you had wished were true
Would be—if I were King

(Written by Richard Francis Kindersley, October, 1932)

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MODERN METHODS OF FEEDING IN INFANCY AND CHILDHOOD

BY

DONALD PATERSON

B A. M D (Edin), F R C P (Lond)

Physician for Diseases of Children Westminster Hospital

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St Thomas's Hospital

SEVENTH EDITION

LONDON

CONSTABLE & COMPANY LTD

10 ORANGE STREET LEICESTER SQUARE W C.2

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The new regulations and designations of the various classes of milk are explained.

Where feeding by weight has been adopted the authors feel that insufficient consideration has been given to the expected weight of the infant. This point is further emphasised.

The section on Premature Feeding has been revised, and Food Tables throughout brought up to date. Further references to recent papers have been given as footnotes.

The latest examination papers in diseases of children both for doctors and nurses have replaced those of previous editions, and the authors hope that this section will continue to be as popular and useful as it appears to have been in the past.

D. P.
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Wherever fruit juice is mentioned which may be unobtainable during the war, 25 milligrams of ascorbic acid in tablet form, or bottled or tinned fruit or tomato juice should be substituted. It is quite necessary for infants and children to have one or other of these preparations every day to maintain good health.

MODERN METHODS OF FEEDING IN INFANCY AND CHILDHOOD

CHAPTER I

BREAST MILK AND NORMAL BREAST FEEDING

'The more fully one learns the fundamentals of the science and the more nearly one masters the art of feeding babies artificially the more one is impressed with the fact that to the young infant mother's milk is a true specific and that during this early period at least artificial feeding is a substitute that necessity alone imposes upon us' —J BRENNEMANN

Normal Breast Feeding The advantages of feeding at the breast have been so markedly demonstrated by the fall in infant mortality during the last twenty years—owing to the increase in the number of breast-fed infants—that it is unnecessary to stress the importance of the subject Breast feeding is still, however, too often abandoned with little or no effort to make it a success *Breast milk suits nearly every child and most women can wholly, or at least partially, breast feed their children* In the first six months of life the mortality is largely among those who are artificially fed

The *advantages to the mother* of breast feeding are —

1 Breast feeding is cheaper than bottle feeding

2 It involves less work, as there are no bottles or teats to be cleaned and sterilised or food to be prepared

3 In the early days of lactation suckling the infant aids the uterus to involute

4 By keeping the infant in good health, much time, worry and money are saved

Advantages to the Child 1 Breast milk is a natural food, and no artificial food, even with the most elaborate modifications, can approach its composition in proteins, fats and carbohydrates, apart from the fact that it contains almost certainly immune bodies which help the child in its early struggle for existence

2 It thrives better and has good motions, a good digestion and sleeps well

3 It is five times less likely to die during the first year of life

4 Being constantly thrown into the company of its mother, it is more likely to be properly cared for than if looked after by some disinterested person

The only disadvantage which may accrue from breast feeding falls on the mother Breast feeding takes a considerable proportion of her time, and she must therefore be willing to sacrifice herself in this respect Very often the calls of social duties are such that a woman is unable to suckle her infant for more than a short time, and again in other cases a woman's employment hinders her from fulfilling this maternal duty, however willing she may be It behoves medical men, therefore, to recognise the advantages of this method of feeding and to point it out to their patient On the other hand, they must recognise the restrictions which breast feeding places upon the mother and in every way make it as easy for her as possible

It is well to remember at once that every woman cannot fully breast feed her infant, and that if a woman must shoulder the responsibility of managing her home and undertake a number of social duties this is always done to the detriment of breast feeding Many women can only accomplish breast feeding when they exclude most of their other duties and interests, and if socially inclined these restrictions are found both extremely irksome and often detrimental to their health Breast feeding actually undermines the health of some women, and as it progresses they become thinner and more run down The weaning of the infant is followed by a resumption of their former good

health. This cannot, however, be said of the majority of women, as many, on the contrary, seem to thrive and put on flesh during this period. *It is essential for the doctor to study the individual woman when advocating breast feeding, as he will have to study the individual child when practising artificial feeding.*

Contra-indications to Breast Feeding. Probably the only universal contra-indication to breast feeding is open tuberculosis in the mother, as she runs the risk of infecting her child and at the same time of weakening herself and allowing the disease to gain headway. Healed tuberculosis is obviously no contra-indication in itself.

Syphilitic infants should be nursed by their mothers when possible. These infants are very prone to digestive upsets, and while being treated should be kept on the breast as far as possible. Since the mothers of syphilitic infants are themselves infected, there is no need to consider the question of maternal infection from an infant with condylomata about its mouth.

In acute infectious disease, such as pneumonia or typhoid fever, the mother is as a rule so ill that the infant must be artificially fed, but mild illnesses of non-infectious nature, such as bronchitis, are no contra-indication to breast feeding. With scarlet fever and diphtheria, where the infant's immunity is high and there is very little likelihood indeed of the child contracting the disease, nursing may be continued if the attack be a mild one.

The occurrence of local disease of the breast—*e.g.*, sore nipples and breast abscess—will be fully discussed under Difficulties of Breast Feeding. It is sufficient to state that they seldom necessitate more than temporary weaning

Malignant disease in itself should not be a contra-indication, but if the breast is involved, or the disease is extensive elsewhere, the mother's health will preclude the possibility. In severe constitutional diseases, such as heart disease, nephritis and grave anæmia, the particular extent of the trouble and the mother's condition must be considered in each case. In themselves, these diseases are not contra-indications to breast feeding.

In epilepsy and insanity the mother may be physically able to nurse her offspring, and breast feeding may, in selected cases, be advised. Care, however, must be taken to protect the infant from physical violence during a fit or outburst.

Vomiting in the case of the breast-fed infant is discussed on p. 114. It must not be taken as an indication for weaning.

When menstruation occurs during lactation, certain infants at the onset of each period tend to have minor digestive upsets; the majority, however, are not affected, and the occurrence of menstruation must never be taken as an indication for weaning.

The occurrence of pregnancy in the lactating mother is somewhat different. If the mother becomes pregnant during the early months of lactation she may be for some time unaware of her condition. In these cases both mother and child appear to do well. Very often when the mother becomes aware of her condition the secretion of milk lessens and may go altogether. This, we think, is largely due to worry of the subsequent early pregnancy interfering with the good health of the mother. Stimulation of the breast tends to set up reflex contractions of the uterus, and suckling may, in some cases, increase the tendency to abortion. Morning vomiting may interfere with proper secretion, and the mother may feel the strain of breast feeding too great to continue when she becomes pregnant. We would say, then, that lactation need not be stopped immediately on the diagnosis of pregnancy being made, but if the child shows symptoms of getting an insufficient supply or if the mother's health is suffering weaning must be carried out.

We have given the contra-indications at the onset in order to emphasise what a small proportion of children *must* be brought up on artificial foods. With care nearly every child can be given its natural food; breast feeding for a month only is better than none at all; *in all cases of doubt decide against weaning.*

Antenatal Measures. For efficient lactation and a

healthy pregnancy a proper diet is essential This must be well balanced in the principal foodstuffs, and contain sufficient salts and vitamins, not only for the mother herself, but for the growing fœtus At least one hot meat meal is necessary daily In addition, a plentiful supply of green vegetable salads and fresh fruit, with eggs and butter, is recommended

The calcium or lime requirements for the bones and teeth of the baby and mother can best be met by the addition of one half to one pint of milk each day Modern research [1 & 2] has shown the wide spread tendency to anæmia during pregnancy This can be prevented by an adequate diet, or cured by the administration of some yeast preparation, together with an easily assimilated iron salt, *e g*, Ferri et ammon cit grs xx, t d s

Antenatal Preparation of Breast and Nipples The preparation of both breasts and nipples should be started in the last two months of pregnancy Harold Waller [3] considers that if this is efficiently carried out failure to establish lactation the discomfort of engorged breasts and the risk of breast abscess would be minimised If the nipples are small and retracted, they should be gently pulled upon or squeezed out, using some Lanolin preparation where necessary Cold water applications will cause the nipples to stand erect

In the majority of women a small amount of dried secretion may be seen on the surface of the nipple towards the end of pregnancy This should be constantly removed by frequent bathing after the use of some simple ointment This dried secretion must not be allowed to block the ducts, if it does the free outflow which is desirable of *colostrum* and *mature milk will* not be *possible* Blocking of the ducts in the antenatal and early postnatal period is suggested if on palpation of the breast hard or

[1] *Lucy Wills and others Ind Journ Medical Research* 1930 and 1939

[2] Macy and Hunscher, *Amer Journ Obst and Gyn*, 1934 Vol 27, p 887

[3] Harold Waller 'Clinical Studies in Lactation, Heinemann 1939

painful nodular swellings can be felt In such a case the proceduro is as follows the nipples must first be cleansed and by gentle pressure the ducts thoroughly emptied of any semi coagulated material Now gently massage from the base of the breast towards the nipple in an effort to empty the blocked duct

If the function of the breast tissue to produce milk is to be established and maintained back pressure and engorgement must be prevented Cracked and blocked nipples with engorged breasts are forerunners of breast abscess

Galactagogues Experimental work in animals has shown that the pituitary secretes a hormone which stimulates breast secretion Further work has shown that œstrin tends to diminish secretion in the breast Experience has not yet shown whether these experimental results may be safely applied to human beings

The Composition and Quantity of Breast Milk The percentage composition of breast milk as given by different observers varies to a certain extent Table I shows the figures quoted by Holt as the average results obtained from many samples

The Fat in human milk shows a variation of from 3 to 5 per cent It differs from the fat of cow s milk in that it is

TABLE I (HOLT) VARIATIONS IN THE COMPOSITION OF BREAST MILK

	Cow's milk. Per cent.	Human milk Per cent.	Common healthy variations in human milk. Per cent.
Water	86–87	88 05	87 82–85 50
Fat	4·00	3 50	3 00– 5 00
Proteins	3 50	1 25	1·00– 2 25
Milk sugar	4 50	7·00	6 00– 7·00
Mineral salts	0 75	0 20	0 18– 0 25

composed largely of oleates and further the fat globules are smaller or in a state of finer emulsion It has a lower melting point and as a result of its fine sub-division is more easily digested than cow s milk fat

The first portion of milk drawn from the breast has a lower fat content than later portions, and this is sometimes used in the treatment of the infant who suffers from "fat dyspepsia." By placing the infant to each breast for a few minutes at each feed, instead of allowing a quarter of an hour at one breast, he obtains the first portion of milk and so a feed which is low in fat.

It is sometimes recommended to add cream to a diluted milk mixture in order to make up the deficiency of fat. This method may induce vomiting, owing to the physical properties of the milk fat, and, where it is considered advisable to add fat to the diet, this is perhaps more usefully done by ordering a half or one teaspoonful of a 50 per cent *cod- or halibut liver oil emulsion* to be given immediately before the feed three times daily. *The addition of more fat to the mother's diet does not* result in the secretion of more fat in the milk, and it may be taken as a rule that it is difficult to modify breast milk by change in the maternal diet.

The Proteins make up 1·25 per cent. to 2 per cent. of human milk in contrast to the 3·5 per cent. or 4 per cent. in cow's milk. These proteins consist of caseinogen, lactalbumen and lactglobulin.

The casein is in a fine colloidal state and coagulates, on the addition of rennet, with difficulty. In the process of digestion in the baby's stomach the clot produced is fine and readily crumbles, and differs from the tough clot produced when the infant is fed on cow's milk. The cause for this is due not only to the higher percentage of casein, but also to the presence of many buffer substances in cow's milk as compared with human milk.

A great difference exists in the proportion of the soluble proteins—lactalbumen and lactglobulin—and the insoluble casein in the two milks. *Breast milk shows a proportion of lactalbumen two parts to casein one part, whereas in cow's milk casein predominates to the extent of four parts to one.*

The two factors of coarser clot and a predominating amount of the so-called insoluble protein account partly

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for the difficulties in artificially feeding the infant on cow's milk, and supply the reason for its use in a diluted state The dilution, it will be seen may reduce the percentages of protein to the level of that found in breast milk—*i e*, from 4 per cent to 2 per cent—but does not affect the proportion of soluble and insoluble protein present, and so the term "humanisation of milk" is never strictly accurate In some proprietary foods an attempt is made to readjust this relation by the use of a vegetable albumen

The Carbohydrate in breast milk *is lactose* and *does not* apparently differ from that found in cow's milk Lactose obtained from cow s milk is often used in artificial feeding and the result is sometimes disappointing for although lactose when taken in breast milk appears to be easily digested and absorbed yet when given in bottle feeds may cause more digestive upset than cane sugar or dextri maltose, two carbohydrates which are not found in the baby's natural food Owing to the higher percentage of sugar present (7 per cent), breast milk is sweeter than cow's milk

Our knowledge of the rôle played by the Salts [1] in milk is still limited Cow's milk contains a much higher per centage of salts than does human milk and differs especially in the fact that in the former half the phos phates are present in inorganic forms whilst in the latter most of the phosphorus *is in organic combination* With further knowledge it may be essential to take the salt content into consideration when preparing an artificial feed for an infant

Attempts [2] at altering the composition of the breast milk by the addition of *proteins fats*, or *carbohydrates* to the diet have been shown to fail With the exception, *then, of the measures described* to give an adequate

[1] Comparative Analysis of Forms of Calcium and Inorganic Phosphorus in Human and Cow s Milk, A F Hess and H R Benjamin *Proc Soc Exper Biolog and Med* June 1933 Vol 30 p 1358

[2] Passage of D fusible Substances into Milk, Leake *et al*, *Acta Paed*, 1933 Vol 16 p 539

supply of calcium salts and of vitamins, there is no need to modify the diet of the lactating woman, providing she is having an adequate supply of food and fluids.

Variations in Quantity of Breast Milk. Not only does the composition of the breast milk vary at different times of the day, but so does the *amount secreted*. The first morning feed may almost double that of the noon feed. Towards the evening, this deficiency may become less marked again. It is important to note this fact, as, if complementary feeds should prove necessary, the 10 a.m., 2 p.m. and 6 p.m. feeds should be those in which the complementary feed is first introduced. Where no test feeds are being carried out, the indications for complementary feeds are given on p. 12.

It has been stated that breast milk is altered in composition during menstruation or in a case of a subsequent pregnancy. There are no grounds for this belief, but it is often found that the quantity of milk secreted may be somewhat decreased.

Bacteriology.[1] The statement that breast milk is sterile is not always strictly true. Even where the milk is suckled from a healthy mother, there may be found some staphylococci (albus) as a contamination from the skin round the nipple. This does not appear to result in any ill effects to the infant. The great difference between the bacterial content of natural milk and the cow's milk lies in the fact that breast milk is taken directly into the baby's mouth, and so the chance of contamination is negligible.

Where the mother is suffering from local infection in the breast the milk may be heavily infected, and, of course, should not be used in feeding the baby. Tuberculous disease of the breasts is extremely rare, and tubercle bacilli do not occur in the milk, but when the mother is suffering from tuberculosis breast feeding must not be allowed, owing to the danger of infecting the infant *at* the breast though not *through* the breast milk. It has been

[1] "The Bacteriology of Human Milk," L. S. Dudgeon and R. C. Jewesbury, *Journal of Hygiene*, Vol. XXIII., No. 1, 1924.

shown that organisms may be excreted in human milk if the mother is the subject of some infection, and the possibility must be borne in mind that where a child at the breast is suffering from gastro-enteritis it may be actually infected through its mother's milk. A bacteriological examination of the milk and also of the baby's stools may show a pathological organism common to both.

There is no doubt that the recently born infant has an *immunity to various infections* derived from the maternal blood whilst in utero, and it is probable that it obtains various immune bodies from breast milk. Such immune bodies have with some difficulty been proved present in human milk.

To summarise: breast feeding offers the advantages of a milk in which the protein content is low and easily digested; the fat is finely emulsified, and its composition differs from that of butter fat, and is more easily digested. It contains what must be recognised as the most suitable quantities of the various elements, and bodies which increase the baby's powers of resistance to infections. All these facts are emphasised in order to point out that wherever possible the baby must be breast fed, and that any attempt to give an ideal artificial food is not likely to be completely successful.

Colostrum. Colostrum is the term applied to the fluid secreted by the breast in the first few days after parturition. Its exact *rôle* is uncertain and it has been regarded simply as an immature secretion. In view of its high protein content, much of which is present as globulin, it has some immunising properties, and this is probably its most important function. A small quantity of sugar is also present together with a variable amount of fat. On microscopic examination large endothelial cells—known as colostrum cells—may be seen, the significance of which is not known. The so-called aperient action of colostrum we attribute to the setting up of the gastro-colic reflex when the fluid is taken into the infant's stomach. Certainly this fluid is of value in preventing to some extent the loss of weight in the new-born.

The Excretion of Drugs in Milk. It has been proved that mercury, calomel, arsenic, bromides, salicylates and iodides are all excreted in the milk. Belladonna and atropin are not excreted in human milk, but these drugs should always be prescribed with care to the mother who is breast-feeding, owing to their tendency to diminish the secretion of milk. Morphine [1] and quinine are for practical purposes not excreted in the breast milk. In the past, some of the vegetable aperients were said to be excreted by the breast, and the practice of giving an aperient to the mother in order to correct constipation in the infant was advised. These drugs are not so excreted, and the fallacy has probably arisen from the fact that where the mother is suffering from diarrhœa, the result of some infection, the child often also has an attack, the result of its having contracted the infection from its mother.

Sulphonamide. Noah Morris states that the sulphonamide group of drugs is secreted in the breast milk. The authors have found no ill effects on the breast-fed infant.

Salvarsan is not excreted in human breast milk, and the practice of giving this drug to the mother in order that the congenitally syphilitic infant may be treated cannot be too strongly deprecated. Even if salvarsan were excreted in the milk, its action would be negligible when taken into the stomach of the infant, and now that congenital syphilis can be adequately treated by early administration of this drug to the infant itself, this method should never be adopted. Recent research [2] shows that the breast fulfils the *rôle* of a barrier, maintaining fixity of composition of the milk, even to the detriment of the mother.

It will be seen, then, that the practitioner can, with ordinary care, prescribe any drug which he thinks necessary for the treatment of ill-health arising in the mother who is breast-feeding

[1] "Elimination of Morphine and Quinine in Milk," Terwilliger and Hatcher, *Surg. Gynec. and Obst.*, 1934, Vol. 58, p. 823.

[2] "Passage of Diffusible Substances into Milk," Leone *et al.*, *Acta Paed.*, 1933, Vol. 16, p. 630.

The Effect of Smoking on Lactation The practice of smoking by the lactating mother is now so prevalent that a word of warning against excess is necessary Clinical experience has shown that from time to time excessive smoking by the mother has had definite toxic effects on the infant she is nursing The stools tend to become green, the infant may be fretful and fail to gain It is claimed that up to seven cigarettes a day can be smoked without upsetting the infant [1 2]

Establishment of Lactation For the first twelve hours after birth the baby sleeps practically the whole time The mother is recovering from the effects of labour and it is not necessary or desirable to put the baby to the breast A practice is often made of giving the infant a teaspoonful of warmed water, in some cases with the addition of a trace of sugar every few hours during the first day We do not consider that this is essential, but it is in no way harmful *At the end of twelve hours the baby is put to the breast every six hours* This teaches the infant to suck, provides him with colostrum and encourages the secretion of milk *It cannot be too strongly emphasised that the most potent stimulant to the secretion of milk is provided by the sucking infant*

For the first feeds the mother should be turned half on the side used, and it is most important that a comfortable position is assured The baby should be placed on the left arm if the left breast is being suckled, and the head well supported The right hand should be used to guide the nipple into the baby's mouth and to keep a grip on the breast so preventing an excessive flow of milk or the tendency in pendulous breasts to interfere with the baby's respiration When the mother is up and about, the feed is best given from an easy low chair

When to give Complementary Feeds After the mother has recovered from the strain of labour (say in twelve hours) the infant should be put to each breast at

[1] W Fmanual *Zeitschr f Kinderh* 1931 Vol 5" p 41
[2] Nicotine in Breast Milk W B Thompson *Amer Journ Obstet and Gynec.*, 1933 Vol 26 p 662

FIG 1 —By pressure on the breast with the index and middle fingers the flow of milk is to some extent controlled and the breast is kept from occluding the infant's nose

[To face p 1

as to whether three-hourly or four-hourly feeding gives the best results. With *three-hourly* feeding the baby is put to the breast *at six, nine, twelve, three, six* and *ten o'clock*, having the long interval at night. *Four-hourly* feeds are best given at *six, ten, two, six* and *ten o'clock*. This *régime* also allows for the interval at night. The times are emphasised, as it is essential that by three-hourly or four-hourly feeding it is not intended that there should be an interval of three or four hours between each feed, but that each feed should start at the same time daily.

Usually the new-born baby is fed every three hours, but when the weight of 10 lb. is attained an attempt should always be made to institute four-hourly feeding. The advantages of the latter method lie in the fact that it allows complete digestion in the infant's stomach of each feed before the next is given, and it also allows the mother a longer interval for her ordinary duties. A certain number of cases, however, are seen where regularly a healthy infant will not wait the full four hours. Half an hour, or even an hour, before the next feed is due the child wakens and continues crying, and it will be found that this type of infant does not thrive well. In such cases the three-hourly method of feeding will often give better results if the same regularity and feeding by the clock method is adopted.

When the baby weighs 10 lb. or more at birth it is not likely to be satisfied by the amount of milk secreted by the breasts in the first two weeks after parturition. Such a baby requires some 25 oz. of breast milk for its needs, and at the start of lactation the breasts will not yield this quantity. The mother may start four-hourly feeding straight away or the baby may be fed three-hourly. With either method the baby will at first be underfed, and a complementary feed of cow's milk and water with added sugar should be given until the breast milk becomes sufficient for the infant's needs.

Time taken over the Breast Feed. If the baby should waken regularly before the 6 a.m. feed, say at 5 a.m., there is no reason why that feed should not be given at

an earlier hour, provided the next feed is given at the routine hour, namely, 9 or 10 a m., depending on whether three- or four-hourly feeding is being given. Again at night, if the mother is out for the evening, or it is inconvenient to feed at 10 p m , there is no harm whatever in giving the last feed at 11 p.m , or even later.

The baby is put to alternate breasts at each feed and allowed to suckle for fifteen to twenty minutes. The infant gets the bulk of his food in the first five minutes, and in practice fifteen minutes will usually be found to give him an adequate feed. Care must be taken to prevent his gulping milk at the onset by keeping firm pressure on the breast. He must never be allowed to sleep at the breast. The practice of putting sugar solutions on the nipple in order to start the baby sucking is a bad one. A little milk squeezed out of the breast into the baby's mouth at the beginning of the feed will usually start the sucking reflex.

Easy Flow of Breast Milk. It should be noted by those ill informed individuals who instruct nurses that baby should be made to work for its feed, how easily milk is obtained by the infant from the breast. On suddenly removing the infant from the breast, after a few moments sucking, it will be noted that the milk spurts forth in several jets from the nipple. In fact, it may be said that the milk almost flows down the child's throat with little or no suction at first.

At the end of the feed the baby is supported in an upright position to allow air swallowed to be eructated, and is at once placed in the cot and allowed to sleep. Too often this simple measure is omitted, and the child after dozing for some minutes wakens up and cries, and perhaps vomits a little. In every case some air is taken into the infant's stomach at each feed and this must always be got rid of before he will sleep comfortably (see p. 90).

The Diet and Hygiene of the Nursing Mother. We have already discussed some of the problems of the *diet* of the pregnant woman and would again emphasise some

of the points of diet when lactation is already established. The supply of calcium salts and the vitamins must be assured, and the half-pint to one pint of milk a day must be continued. It may be necessary to add a word of warning about the excessive use of milk and milk foods in these cases. So many mothers will not tolerate milk or milk foods in excess without getting digestive upsets, and care must be taken never to push milk to this extent. In the case of the working mother it is essential that she should obtain an adequate supply of food as such. One hot meal a day must be insisted on. Alcohol, especially in the form of stout, enjoyed a considerable reputation as an aid to the secretion of milk. It may be said at once that alcohol has no such effect. On the other hand, it is not true that alcohol is excreted in breast milk unless the amount taken is grossly excessive. If a mother has been in the habit of taking an occasional alcoholic drink, this need not be restricted during lactation. Perhaps the most important point to remember is that the mother should secure an adequate supply of *fluid*. She must realise that extra fluid is to be taken each day to supply the needs of the functioning breast, and, where any doubt exists as to this extra fluid being taken, she must be instructed to drink a glass of water immediately before she feeds her baby. The doctor will remember the possibility of the occurrence of what may be termed "lactation-anæmia." [1]

Constipation is best treated by the increase in the amount of greenstuff and fruits eaten and by rational exercise. If drugs are necessary, senna pods, cascara or liquid paraffin may be used. Saline aperients are to be avoided owing to their tendency to diminish secretion by increased loss of fluid. Minor digestive troubles and other forms of ill-health may be treated in the ordinary way and without fear of the baby being affected by drugs excreted in the milk.

We have no doubt that a malted milk, such as

[1] "Human Milk Studies," S. S. M'Cosh *et al*, *Journal of Nutrition*, 1934, Vol. 7.

Horlick's Malted Milk, Ovaltine or Lactagol, which has a high content of carbohydrate as malt, has a definitely stimulating action on the flow of milk from the breast. We suggest two to three glasses may be given in the day where it agrees with the mother.

The effect of *smoking* has been discussed on p. 12.

Are there any foods which should be definitely excluded from the diet of a nursing mother? This question cannot be answered except by studying each individual case. In the authors' opinion, any food which is digested and appears to agree thoroughly with an individual woman can have no deleterious effect on her milk, and indirectly on her baby. Such an indigestible article of diet as cucumbers, for example, may upset one woman, causing her to have abdominal pain, sleeplessness and consequently a faulty supply of milk, whereas another woman, who tolerates this article perfectly, is undisturbed herself and her baby thrives. Many midwives and maternity nurses seem to throw an air of mystery and superstition over the diet of a nursing mother, claiming large numbers of articles as forbidden with no real grounds for doing so. We protest against this pretence of mystery

Weaning and the Commencement of Mixed Feeding. The weaning of an infant depends largely on the method of feeding up to the time when weaning becomes desirable or necessary. Some general rules are applicable in every case. Weaning should always take place gradually, for by this means the tendency to minor disturbances in the infant is avoided and the mother's secretion, lacking the regular stimulation of sucking, is slowly diminished, and painful, engorged breasts are prevented. In order to avoid these minor upsets of digestion, it is advisable to wean in cold rather than in warm months.

At what age should some *addition* to the breast milk be made? We think the addition of vegetable and cereals should not be delayed beyond the age of five months, or when the baby has reached the weight of 15 lb. When an infant reaches 15 lb. he requires about

Diet for a Normal Healthy Breast-fed Infant from Six to Nine Months Old. (Weight 15 to 18 lb.)

Feeding Times—6 *a m*, 10 *a m*, 2 *p m*, 6 *p m*, 10 *p m*.

6 *a m*.

Give both breasts, seven minutes to each side

10 *a m*

1. Boiled milk . . 2 oz.
   Water . . 1 oz
   Sugar . . . 1 level teaspoonful

   To this add one to three heaped teaspoonfuls of Chapman's Entire *Wheat Food, Robinson's Patent Groats or Barley or Groult's Cream* of Rice or Farex (See footnote re cooking) Half a teaspoonful of the yolk of a lightly boiled egg should be slowly introduced along with this feed, and gradually increased to two spoonfuls, if well tolerated
2. After this feed give the breast

2 *p m*

1. Boiled milk, . . 2 oz.
   Water. . . 1 oz
   Sugar . . . 1 level teaspoonful.
   Add to this two tablespoonfuls of bone and vegetable broth (see below) One to two tablespoons of finely puréed homogenised vegetables such as Heinz, Libby's or Nestlé's as recommended
2. Give the breast

6 *p m*

1. Give the feed exactly as at 10 a.m, but add one to three heaped teaspoonfuls of a different cereal from the one given at that time
2. Give the breast

10 *p m*.

Give the breast only, as at 6 a m

Fruit Juice

Orange or tomato juice, two to three teaspoonfuls, diluted with water and sweetened with sugar, should be given daily. A convenient time for this is between 6 and 10 a.m, or at tea time

To Prevent Rickets

Give an eggspoonful of cod liver oil immediately before three of the feeds, or one drop of halibut liver oil

Re Cooking Cereal

All milk should be brought to the boil In making up the cereal for the 10 a m and 6 p.m feeds, such as Groats, Cream of Rice, etc, this needs to be cooked directly for at least twenty minutes, or from half an hour to an hour in a double saucepan. It may be added to the rest of the feed and the whole cooked for the specified time, or it may be cooked with water and then stirred into the rest of the feed, when it is thoroughly cooked.

N.B Owing to the thick nature of this feed, it is necessary to make a large hole in the teat if given from a bottle, but, if possible, it is more desirable to spoon feed from a cup

Bone and Vegetable Broth

Take 1 lb of veal bones or beef bones, well broken up Cover with water, and add one teaspoonful of vinegar Occasionally, say once a fortnight, add a piece of calves' or ox liver (about 2 oz.) Simmer for from one to four hours Now add vegetables (carrots, cauliflower, green vegetables and one potato) Simmer for one more hour, strain and allow to set Give one to two tablespoonfuls in the 2 p.m. feed (as directed) (The broth is best cooked in a double saucepan, and should keep for three days if kept in a cool place)

35 oz of breast milk in the day The majority of mothers are not able to secrete more than this quantity without detriment to their own health Something more than breast milk seems to be required by infants after their weight has reached 15 lb The bulk of the milk has become so great that there is a tendency for the stomach to be overfilled and more concentrated food seems indicated

The tendency is becoming more and more marked to start mixed feeding in earlier months than used to be the common practice, and as a working rule the attainment of the 15 lb standard may be taken as a guide to the introduction of this mixed feeding The child is given a dinner at 2 p m of one to two tablespoonfuls of bone and vegetable broth This may be given before the breast feed, and should be given by spoon rather than from a bottle Shortly after this the soup may be thickened by the addition of potato or some cereal as groats or ground rice The baby is seen to be more satisfied, and all of the breast milk is not withdrawn from the breast This therefore constitutes the very commencement of weaning, which, by this method, should be an extremely gradual process The second stage is to give a feed of groats (one third to one half teacupful) at the 10 a m feed At 6 p m one third to one-half of a teacupful of some starchy preparation, such as Cream of Rice, Robb's Biscuit, Neave's or Sister Laura's or Ridge's, Allenbury No III, or Farex, Robinson's Patent Groats or Barley, or Chapman's Whole Wheat flour, or Pablum, may slowly be added The fourth stage is the addition of two heaped eggspoonfuls of the yolk of a soft boiled egg to the groats at 10 a m Rusks should not be given except at meal times, and then only when the lower incisors have appeared

Each of the stages described should occupy about one week *This regime should be continued until the infant* has cut several teeth, and, round about the age of nine months in a normal healthy child, it can be completely weaned Again, this should be done gradually

The Technique of Early Weaning It is often necessary to wean a child in the first few months This may be

because of ill health on the part of the mother, or for social reasons. When this step must be taken, the following technique is recommended:—

1. On the first day the mid-day breast feed should be replaced by an adequate bottle feed, calculated on the weight of the infant.

2. The second day the 10 a.m. feed should be replaced by an artificial feed.

3. The third day the 6 p.m. feed is replaced by a bottle feed.

4. The fifth day (two days later) the 10 p.m. feed is replaced by a bottle feed. Any breast milk present should be pumped or expressed off. This is most easily done after a hot bath.

5. On the seventh or eighth day the 6 a.m. feed should be discontinued, depending on how quickly the mother's milk diminishes. If the breasts become full, engorged and painful, a hot bath will relax the nipples, and the milk can be expressed or pumped off readily, relieving them.

The Treatment of the Breasts at Weaning. If weaning has been carried out in a gradual manner as described above, there is little danger of breast trouble in the mother. If the mother should complain, relief may be given by supporting the breasts by bandaging. The mother is instructed to cut down her fluids during the weaning period and the bowels may be freely opened by means of saline aperients each morning. Care must be taken, however, to avoid excessive purgation. The breasts tend to be most troublesome at night. If this occurs it is a good practice to empty both breasts completely by means of the pump and then to strap securely for the night. At the end of the weaning period, if the breasts are still secreting, they must be completely emptied and kept continuously bandaged for a few days. Belladonna has often been used as a means of stopping secretion, either given by mouth or applied as a plaster to the breast. It does not seem to have any value unless given in doses which produce symptoms of poisoning.

CHAPTER II

DIFFICULTIES IN BREAST FEEDING

Failure to establish Lactation owing to Defect in the Child. Failure to establish lactation may be due to some defect in the child or in the mother. In the case of the infant one of the commonest causes is by interference with the respiration of the child whilst at the breast Two minor conditions may account for this. There may be some degree of *nasal catarrh*, and it is always important to see that the nose is clear before suckling starts; this may usually be accomplished by using *small pledgets of cotton wool*. A second *minor obstruction* is caused by a *pendulous breast* falling over the child's face; this is easily controlled by holding the breast clear on the part of the mother (see Fig. 1, facing p 12).

Transient soreness of the infant's mouth, readily recognised on inspection—*e.g.*, thrush—is another cause of failure to take the breast. When this occurs the infant may be fed for two days on milk expressed into a spoon whilst the local condition is treated with glycerine and borax, after thoroughly cleansing the mouth several times daily.

More serious obstacles than these are the presence of *hare lip and cleft palate malformations*. In hare lip, if the palate *is intact, there is little interference with suckling*. Many surgeons consider that at three months the operation of repair may be carried out. For the first few days after operation the baby is fed on expressed milk and it is seldom necessary to wean completely The degree of completeness in cleft palate malformations determines the likelihood of successful breast feeding. If the posterior part only is deficient, suckling is usual With greater degrees, there is marked interference with respiration,

and the infant interrupts feeding every few seconds to breathe It may be possible to suckle successfully in some of these cases, but *in many* respiration is completely interfered with, milk regurgitates through the nose and it is impossible to continue natural feeding Every effort should be made to express milk and to feed as long as possible on this whilst the question of an early operation must be seriously considered

The infant especially the premature infant, may be born so weakly that the *act of sucking entails too great a strain* This applies still more to those infants who are suffering from some organic disease *e g*, congenital heart disease Such a child should always, if possible be spoon fed on milk expressed from the mother (see p 130) and it cannot be too strongly emphasised that its chance of survival depends largely on its obtaining breast milk It is in many cases quite possible to establish milk secretion without putting the baby to the breast by means of massage, manual expression, and the complete emptying of the breast with a pump As soon as the weakly infant shows signs of returning strength, he should be placed to the breast and afterwards three hourly feeding will be found the best method to adopt

There is a type of infant who is born healthy, of normal birth weight, and whose mother has an adequate supply of milk and yet who does not thrive at the breast When observed it will be seen that the child "mouths" at the breast The nipple is never grasped and the infant makes no attempt to suck properly Some of these cases suggest at once a birth injury, or this failure to suck may be the first sign of mental defect, but in the absence of gross disease, this type of case can only be accounted for by the failure to establish a sucking reflex Every effort must be made to encourage the infant by expressing milk from the breast from time to time and feeding him on this, and care must be taken not to resort, if possible to artificial feeding The successful feeding of these cases depends almost entirely on the maternal effort or on the personality of the nurse in charge of the case

Failure to establish Lactation due to the Mother. In the absence of severe illness, this may be due to lack of ante-natal care (see p. 5), or

1. Poorly developed breasts.
2. Malformation of the nipples.
3. Affections of the nipples.
4. Breast infections.

It has to be recognised that a certain proportion of women who are really anxious to feed their children have mammary glands which contain little true secreting tissue. The poor breast will, however, often yield a certain proportion of milk if every step is taken to encourage secretion. These methods will be discussed later.

The care of the *malformed nipple*, engorged breasts and choked ducts has already been dealt with under ante-natal treatment (see p. 5). *Markedly retracted nipples* may often be withdrawn if the breast pump has been efficiently used in the last two months of pregnancy. If the retraction persists, attempts should be made to draw out the nipple before each feed; if this is not successful, lactation may often be carried out by means of the nipple shield. Special care must, in these cases, be taken to see that the infant gets a sufficient supply, and if necessary the breast may be emptied at the end of a feed by expression or the use of the pump, and the expressed milk given to the child.

Sore nipples often provide an obstacle to efficient breast feeding. If suitable hardening methods have been adopted during pregnancy, this trouble is not likely to be encountered. During lactation any tendency to soreness may be treated by means of a spirit lotion, and, if cracks should develop, Friar's balsam may be used after each feed. A nipple shield is sometimes advisable, especially if the child should prove a very strong sucker. If the cracks persist under treatment the sound breast only should be used whilst the affected side is being treated. Callous cracks may be stimulated by touching with silver nitrate, or a lotio hydrarg. perchlor 1/1000 may be pre-

scribed The breast must be regularly emptied during this treatment

Breast Infections (see p 5) Infections of the breast may be seen in the first few days of the puerperium, although true breast abscess is seldom met with till later in lactation It may be convenient to discuss the subject here *Small tender areas representing a mild degree of mastitis occur not rarely in the functioning breast Heat, in the form of fomentations, will usually relieve the pain of these* When the infection is more severe a true breast abscess develops The ultimate treatment of this is a surgical evacuation and drainage of the pus For all practical purposes, breast milk is sterile, and in cases of breast abscess the tendency of the organism to be excreted in the milk has to be considered Pus, blood stained fluid and the organisms have been found in the milk from a breast where an abscess is present

The difficulties which we have discussed so far as causes of failure in the establishment of lactation are for the most part readily diagnosed, and depend on the examination of the breast and its nipples and on the examination of the baby's mouth and nasal passages *Much more difficult to recognise and to treat are those failures* which come under the heading of insufficient quantity or quality of the milk, and it is convenient here to give the methods of increasing the flow of milk

Once lactation is established, the flow of milk is largely determined by the demand which is made upon the breast

Methods of Increasing the Quantity of Breast Milk. The supply can be increased by—

1 Making certain that the infant is completely emptying the breast at each feed, and if not doing so, by expressing the residue by hand or the pump The breast must be empty at the end of each feed

2 Improving the mother's general health by attending to her diet, sleep and exercise and by excluding domestic worries

3 Adding to her diet a pint of milk daily or one of the malted foods Nervous upsets probably do not affect

the milk supply directly, but indirectly by altering her general habits of eating, sleeping and exercise.

4. Inducing in the mother that desire to nurse her infant which is so essential to success. This may be done by an exaggerated air of optimism on the part of those about her.

5. Massage of the breast with applications of hot and cold water alternately have been found very useful. Breast massage consists of rubbing and kneading the breast between the hands and of squeezing the breast towards the nipple every three or four hours. This is followed by bathing, where two basins of water are necessary. The mother first sponges the breast with cold water and immediately afterwards follows this with water which is as hot as can be comfortably borne.

It cannot be stressed too strongly, however, that the vigorous suction of the infant at the nipple at regular intervals is the all-important factor in establishing and maintaining an adequate secretion of breast milk.

Underfeeding. Obviously, if the infant is underfed, this may be due either to an insufficient quantity of breast milk or to its poor quality. Should the quantity be deficient, the infant fails to gain in weight, tends to be extremely constipated, or to pass frequent small greenish (hunger) stools and to cry incessantly during the day and often at night. We have known some cases, however, of starved infants, where, due to early training, the infant has slept well at night, but has been extremely restless during the day. It is rare that a starved infant can be said to be a "good" child.

Often where there is an insufficient supply of breast milk there is *vomiting* of food. This is, as a rule, due to *air swallowing*. It is normal for every infant to swallow a certain amount of *air along with its feed*. When, however, he is excessively hungry and the supply of milk is insufficient, sucking at the empty breast soon fills the infant with "wind." It is in such cases as these that the midwife's expression of "windy milk" has arisen. We do not believe that such a thing as "windy milk" exists—

the explanation too often is *not enough milk*. A very common history that mothers give in these cases of underfeeding is a description of the baby passing a small green mucus-containing stool with some flatus during the feed, or immediately afterwards.

Test Feeds. The diagnosis of insufficient quantity of breast milk ought not to be difficult. No mother can tell by the size of her breasts, by the apparent flowing away of the milk, or by the tenseness or feel of the breasts, whether they contain little or much milk.

There is only one certain way of ascertaining the amount of milk in the breast, and that is by a "*test feed*." The baby is weighed before being put to the breast and *is weighed immediately after the feed without altering its* clothes. If a stool has been passed the napkin must not be changed between the two weighings. The difference in the weight shows the amount of breast milk taken.

Amount of Breast Milk required in the Day. It has already been stated that breast feeds vary in their yield during the day, the early morning feeds tend to be largest, and by noon or early afternoon the feed has dropped sometimes to half the quantity of the first feed. At night again, the feeds tend to become bigger. The period of breast secretion therefore coincides with that part of the day in which the mother's activity is greatest.

It has been estimated, and is our experience, that the average infant, up to a body weight of 15 lb., requires 2¼ to 2½ oz. of breast milk per pound body weight per day—*e.g.*, an infant weighing 10 lb. will require 22 to 25 oz. of breast milk in the twenty-four hours. One isolated test feed is of no practical value, but the complete output of the mother for the day should be ascertained to be of real value. Supposing this infant weighing 10 lb. is fed four-hourly (five feeds), the average for each feed would be about 5 oz., but in practice some test feeds would be found to be considerably below and some above this amount.

Individual requirements among babies differ very considerably. It is a matter of common experience that some

infants from birth are nervous, sleep badly, are easily disturbed and often cry. They thrive badly and require large feeds to make them get on well. Very often they are boys. Other infants quite the reverse sleep well, are "good" babies, and seem well nourished on quite small quantities. More often than not these are girls. We mention these types to make it quite plain that the estimate of the breast milk requirements given is, and can only be, an approximate one. We believe that no rule can ever be laid down which applies to every infant. The infant itself is the final judge in this most important matter (see p. 85, Chapter V).

Complementary Feeding and when it should be used. When the child's failure to gain weight and the appearance of the symptoms already mentioned as indicating starvation suggest that it is receiving a deficient quantity of milk, test feeds must be done. If the test feeds confirm the diagnosis of insufficient quantity of breast milk the next step is to complement the feeds. Complementary feeds, or the addition of a small artificial feed after the breast feed, are the best. Supplementary feeds, that is, the giving of a complete artificial feed in place of the breast feed, should never be resorted to, as weaning will automatically commence.

The ideal complementary feed is that of human milk, obtained from some mother who is secreting more than is necessary for her own infant. This is given to the infant who is not gaining immediately after it has been to its mother's breast. Wet nursing, where the infant gets the whole of its supply from the foster-mother, is not so popular in this country as it deserves to be, largely owing to lack of suitable foster-mothers. With care in selection, and after a preliminary inquiry into the health of the foster-mother, and the obtaining of a negative Wassermann reaction, this practice may at times be the only method of successfully rearing a weakly infant.

Rules for Complementary Feeding. 1. Both breasts should be given at each feed, but the breasts should be given first in rotation.

2 The time the child is left at the breast should be only that sufficient to empty it, which may be from two to five or six minutes each Sucking at an empty breast fills the child full of wind and only succeeds in further upsetting it

3 The complementary feed must always be given after the breast feed This ensures that the breasts are completely empty and that they are stimulated by the vigorous sucking of a healthy infant

4 Feeds must never be made too sweet, and therefore sweetened condensed milk is contra indicated The best mixture to use as a complementary feed should consist of equal parts of cow's milk and water, with no more than a level teaspoonful of sugar to each 2 oz of the mixture Certain authorities advocate the use of sweetened condensed milk given "on the spoon" at the end of the breast feed to augment it This is somewhat irrational, as it does not allow for the fact that it is not only a shortage of the solid constituents of milk, but also of the fluid portion

5 The ideal to aim at is to test feed all the breast feeds and make up the deficiency with a simple milk mixture In actual practice this is not always very practicable, and where test feeding cannot be carried out, the complementary feed should be given after the twelve three and six o'clock feeds, or if the infant is fed four hourly at the ten, two and six o'clock feeds, after he has been at the breast

6 Throughout the period of complementary feeding every effort should be made to maintain and to increase the mother's supply of milk by the methods already mentioned (p 24)

7 It is always well to err on the side of giving a little less than a little more out of the bottle, or it will be found that the breast milk tends to fail progressively

Quality of Milk When the question of the quality of the milk is discussed we find many authorities, on the one hand, stating that this is never affected to any appreciable degree, and, on the other hand, we hear of weaning being

advised because "the milk is blue." Chemical analysis of milk entails the collection of an average sample from the breast and, apart from the roughest methods, some hours' investigation in the laboratory. The usual method of collection is to use a breast pump, reject the first ounce or so secreted, and take a sample of the next, or so-called "middle milk." Investigation of the isolated sample taken in this manner, owing to the daily variation in the constituents in breast milk, cannot give very reliable information. For a proper estimation of the constituents of the milk an average sample from four feeds is necessary.

Practically, it is found that laboratory results seldom give any true help in a difficult case. We think that in a very small proportion of breast-fed infants there is some defect in the quality of the breast milk, and where a child is failing to gain weight, when the amount of milk secreted is shown by test feeding to be normal, it is advisable to resort to complementary feeding.

Overfeeding. Whether this is actually a more common occurrence than underfeeding is a matter of opinion. Certainly a doctor is required very much oftener in cases of under- rather than over-feeding, as Nature tends to correct the latter fault herself. The symptoms by which the diagnosis of overfeeding is made are :—

1. Frequent loose motions. At first these are of a good colour, but later show curds and tend to excoriate the buttocks.

2. Frequent small vomits after feeds not produced by eructations of wind.

3. Colic, restlessness, disturbed sleep, sweating of the head and flushing of the face after feeds are often present.

4. At first there is an excessive gain in weight, often 10 or more ounces being gained in the week. With increasing gastro-intestinal disturbances, however, the child's weight may readily become stationary.

The chief cause of overfeeding is too frequent feeding or the leaving of the child at the breast for too long a period when there is an over-abundant supply of milk, as

shown by the test feed. Under these circumstances and *despite the small vomits*, and the inclination to looseness of the bowels, the mother may think the child is being underfed because of its crying and restlessness.

Treatment. 1. *Test feeds* should be done to ascertain the extent of the overfeeding.

2. If both breasts have previously been used at each feed, only one breast should be allowed.

3. The periods between the feeds should be lengthened if a three-hourly feed *régime* had previously been used, that is, the baby should be fed every four hours. Especial care must be taken to see that no night feed is given between 10 p.m. and 6 a.m., or the 10 p.m. feed discontinued altogether.

4. The time at the breast should be shortened. In the first five to seven minutes the infant's stomach becomes filled largely with milk, but also with a small amount of swallowed air. After this there is a pause in the feeding, during which the pylorus opens and a considerable portion of the milk enters the duodenum. The infant then rouses and the stomach is filled a second time. It is then that the overfeeding occurs. By test feeding the child at various stages of the feed a suitable period of time at the breast may be determined. For amount of milk necessary see p. 26.

5. A little water given immediately before feeds satisfies the infant's thirst and tends to prevent gulping of milk and overfeeding. This is administered from a spoon a few minutes before the baby is put to the breast.

Diarrhœa in Breast-fed Infants. If an infant on the breast develops diarrhœa the questions should be asked—

1. Has the infant developed an infection in the bowel? The breast-fed infant is less susceptible to acute gastro-enteritis than an artificially-fed baby, but such infections do occasionally occur. They are characterised by fever, and blood and mucus in the stools, and the clinical picture does not differ from a similar infection in an artificially-fed infant.

2. Is the diarrhœa merely a symptom of infection

in some other part of the body (*e.g.*, symptomatic diarrhœa seen in acute otitis media)? This is a much commoner cause of diarrhœa than that under heading (1). A careful clinical examination of the urine, ears, throat and chest will exclude parenteral infections as a cause of this symptom. In such cases there is no indication whatever to stop breast-feeding.

3. Is there something wrong in the mother's milk which has set up an acute indigestion? Variations in the protein and carbohydrate content of human milk are slight, and give rise to no symptoms (see Table I.). The fat or cream content, however, may vary widely, and may set up an acute fat dyspepsia with diarrhœa in an especially sensitive infant. It may be necessary in a severe case to wean the infant.

4. Has the infant an intolerance for normal breast milk, allergy to casein or lactalbumen? It is a well-recognised fact that certain infants show allergic symptoms to normal breast milk. These symptoms may appear as eczema, urticaria, diarrhœa, and vomiting. Where the diarrhœa is severe, weaning may be necessary.

5. Is the quantity of breast milk too much or too little? In both cases diarrhœa may appear as a symptom. Actually in our experience diarrhœa is produced more frequently in the underfed rather than the overfed infant. Test feeds will determine whether the diarrhœa results from under- or over-feeding. The treatment of each has already been described.

Failure of the Infant to thrive on Normal Breast Milk. The stools of breast-fed infants are normally acid. This is the result of the relatively high proportion of fat and sugar to the casein or curd which is present in small amounts only. Each individual infant reacts in a different way to the food offered, and in some the intestine does not seem able to tolerate this normal acid stool. These infants require a higher proportion of protein and lower proportion of fat and sugar, which produce an alkaline stool, to maintain their health and progress. There are a variety of ways of changing the acid stool to one which is alkaline.

One of the best is the giving of half to one ounce of whole boiled cow's milk at each feed in addition to the breast Another way is by using one of the preparations available, such as albulactin powdered casein, or the half cream or skimmed dried milks, such as Cow and Gate or Trufood, which contain a relatively high proportion of protein to the fat

CHAPTER III

COW'S MILK AND INFANT FOODS

The attitude of medical men towards the subject of artificial feeding varies. In some there is a complete indifference, the subject appears too trifling to bother about, and the feeding of the infant is left to the mother or nurse to manage, or perhaps the advice is given to use patent foods and to follow the directions on the tin. Others, confused by the various systems advocated for feeding the baby artificially, and finding that no method will give universally good results, think the subject too difficult, and when the need arises refer the "feeding case" to the specialist. A majority of doctors, however, now appreciate the number of infant lives which can be saved by learning to apply the principles which underlie all artificial feeding of the baby, *to insist on breast feeding wherever possible*, and, where this fails, to modify the artificial feeds to the individual requirements of the case.

We propose to discuss cow's milk and point out the essential differences in composition between it and breast milk, to state the difficulties encountered in natural feeding and how they may be overcome so that most infants may be breast-fed, and to mention the symptoms which indicate that the artificial feed, if such has been prescribed, is not a suitable one.

Milk and Proprietary Foods. For the rational feeding of the infant by modern methods some knowledge is necessary, not only of the composition of breast milk and cow's milk with their common variations, but also of the numerous proprietary foods now on the market.

In this chapter are given the main constituents of human milk and cow's milk, together with the composition of the more commonly used dried milks, and those milk foods to which starch has been added

COW'S MILK

Table II shows the average composition of milk obtained from different mammals The proteins are shown as casein and lactalbumen which includes lactglobulin, and together the latter two are known as the soluble protein of milk

TABLE II SHOWING THE COMPOSITION OF MILK FROM DIFFERENT MAMMALS

(Modified from Abt's Pediatrics)

Mammal	Specific gravity	Water	Casein.	Albumen.	Total protein.	Fat	Sugar	Ash.	Total solids
Man	1 0308	87 58	0 80	1 21	2 01	3 74	6 37	0 30	12 42
Cow	1 0313	87 27	2 89	0 51	3 39	3 68	4 94	0 72	12 73
Ass	1 032	90 12	0 79	1 06	1 85	1 37	6 19	0 47	9 86
Goat[1]	1 0305	86 88	2 87	0 89	3 76	4 07	4 64	0 85	13 12
Mare	1 0347	90 68	1 30	0 75	2 05	1 14	5 87	0 36	9 42

Casein Casein is a phospho protein never found anywhere except in milk Its exact source is doubtful, but it is suggested that it is made from serum proteins in the mammary gland itself It occurs in milk as calcium caseinate, a tribasic acid, part of which is soluble and filterable and part is not When acted on by dilute acids a fine curd is formed, when the acidity is increased the clot becomes heavy and in the presence of excess of acid the clot re-dissolves It is soluble in alkalis, and is coagulated by rennet, but not by boiling

Lactalbumen Is closely related to serum albumen having the same physical and chemical properties, but that it is not identical can be shown by means of immune reactions . Lactglobulin is identical with serumglobulin and carries immune properties Lactalbumen and globulin are coagulated by heat but not by rennet

Fat Fat occurring in milk consists of the triglycerides cholesterol and absorbed pigment, it appears that the fat occurs as a loose compound and not as a mixture The glycerides are those of the non volatile acids, stearic,

[1] A dried goat's milk powder is made by Cow & Gate Ltd under the name of Caprolac.

palmitic and oleic, and of volatile acids, such as butyric, caprylic, etc. The fat readily decomposes under the influence of light, oxygen and micro-organisms.

Sugar. Sugar in milk occurs only as lactose, a di-saccharide, which on hydrolysis splits into dextrose and galactose. Like casein, it is not found in Nature except in milk.

Ash. The ash of milk consists of the salts of potassium, sodium, citric acid and chlorine. Phosphates are in solution combined with calcium and magnesium, whilst di- and tri-phosphates are in suspension. Milk contains *circa* 0·5 mg. of iron per litre. The normal child requires from 6 to 12 mg. daily (Sherman). An infant who is artificially fed runs a risk of deficiency of iron in its food. This has led some of the more progressive dried milk manufacturers to add iron in some form to their products.

Milk absorbs gases from the air, so that a sample will contain oxygen, nitrogen and carbon dioxide. It also absorbs readily noxious gases, and the so-called characteristic smell of milk is due to the absorption of gases from the farm. Pure milk should be for all practical purposes odourless.

Many attempts have been made in the past to vary the composition of cow's milk by varying the diet of the animal, but all have failed, provided an adequate diet is being given. The greatest variation in milk is usually in that of its fat content; some breeds of cows will give a milk yielding 3·6 to 3·5 per cent. of fat, and a good Jersey cow will yield about 5·5 per cent. In fact, the breed of the cow has more to do with the composition of the milk than the actual diet which is given to the animal. There is also a variation in the differences due to the season, to the health of the animal, to the skill of the milker, and to the relation between the time of milking and the previous calving of the animal. It is well to note the variations in the percentage composition of cow's milk, in order to realise that in the methods described for humanising milk the result of dilution and the addition of fat and carbohydrate gives a mixture the proportion of

whose constituents varies with the original composition of the milk used.

Bacteriology. Milk contains certain enzymes, agglutinins and antitoxins. The bacterial content of fresh milk is diminished in the first hours after milking by the action of these bodies, and some of the immunity to certain infections shown by the newly born may be due to these substances in the milk. Colostrum, owing to its rich globulin content, is thought to be more effective than milk in conveying immunity to the young animal.

Samples of milk collected from the cow's udder show micrococci, streptococci and sometimes *B. coli*. These organisms, chiefly by their action on the lactose in milk and to a lesser extent by their proteolytic action, are responsible for the souring of milk with the production of acid, gas and clots, such souring being delayed by immediate cooling of the collected samples or by the various means used in "sterilising" milk.

The sources of contamination during milking are many. One of the most fertile is the cow's coat; dirt drying on this is shed into the milk pail where no precautions are taken to clean the animal before milking; infection also comes from the hands and clothes of the milker, especially when "wet milking" is used. Stable dirt and lack of cleanliness in the dairy utensils may cause further infection. When the usual methods of transport and retailing of milk are considered, it is not surprising that milk bought in our towns is often heavily infected, even when obtained from a healthy herd in the first place. In the last twenty years there has been a marked improvement in dairy methods, and it is now possible to obtain milk which has been collected from healthy herds under standardised conditions known as certified milk. This will be discussed later, but sufficient has been said to indicate that for practical purposes "raw" milk should not be given to a baby.

Widespread epidemics have resulted from contaminated milk, such as typhoid and scarlet fevers, and outbreaks of epidemic sore throat. In this connection the

possibility of a carrier among the farm servants is to be remembered. Perhaps more important than this is the relation of bovine tuberculosis to the human type of disease. Tuberculosis is common among cattle and tubercle bacilli can frequently be demonstrated in samples of milk taken at random from various sources.

Of recent years the importance of undulant fever (infection by *B. Abortis* or *B. Melitensis*) has been emphasised. Out of 147 cases investigated [1] 141 patients were found to have been drinking raw milk, that is cow's milk which had not been boiled or pasteurised. It is claimed that from 20 to 30 per cent. of milk in this country is infected by the organisms of undulant fever. The need for clean milk, and for pasteurisation or boiling before use, is further emphasised by these facts. It has been suggested that the danger of tuberculosis from milk is rather a theoretical than a practical one; in fact, the theory is sometimes held that the child by ingesting milk containing these bacilli from time to time has its immunity raised for this disease. There are more rational ways of increasing immunity than by the use of infected milk.

Whether summer diarrhœa or infective gastro-enteritis is caused by milk-borne infection has not yet been definitely proved. Perhaps some 10 per cent of cases occurring in London may be directly attributable to an infected milk, others depending on factors to be mentioned later. *Wherever possible cow's milk used in artificial feeding should be obtained from a mixed herd, and not from one cow only*, as the keeping of special cows for invalids and infants increases the chance of infected milk if the animals should not be perfectly healthy.

Other milks than that obtained from the cow have been used in the artificial feeding of infants, but they afford no special advantages. Of these, perhaps the commonest has been goat's milk, which approximates in composition to cow's milk. It is said that the danger

[1] Sir Weldon Dalrymple Champneys: *Lancet*, January 13th, 1934, p. 66

of tuberculosis is less in this animal, but the relation of goat's milk to Malta fever in certain countries must be remembered.

Graded Milks. Owing to the gross contamination to which so much of our milk is exposed, attempts have been made to put on the market a clean milk which is known to be of a certain standard of purity, such standard conforming to that laid down by Order under the Milk and Dairies Act of 1922. These are known as—

1. Tuberculin-tested Milk[1 2 3] is milk from cows which have passed a veterinary examination and a tuberculin test; it is bottled on the farm or elsewhere; and it may be raw, or pasteurised. If it is bottled on the farm, it may be described on the bottle caps or cartons as Tuberculin-tested Milk (Certified) If it is pasteurised it is described as Tuberculin-tested Milk (Pasteurised) It must satisfy certain bacteriological tests.

2. Accredited Milk is raw milk from cows which have passed a veterinary examination; it is bottled on the farm or elsewhere. It must satisfy the same bacteriological tests as raw tuberculin-tested milk.

3. Pasteurised Milk is milk which has been retained at a temperature of 145° to 150° F. for at least thirty minutes; and does not contain more than 100,000 bacteria per millilitre.

Must Milk be Boiled or Pasteurised? This matter has been carefully considered by the Royal College of Physicians, and the following resolutions were passed and published in April 1934:—

"1. That a daily ration of milk is important for the growth and health of children.

"2. That the risk of tuberculosis and other disease following the consumption of raw milk is considerable.

"3. That such risk can be obviated by the use of

[1] Ministry of Health, Memo 197, 1936, Foods. H.M. Stationery Office

[2] Ministry of Health Statutory Rules and Orders (Milk and Dairies, England, 1936), No 356 H.M Stationery Office

[3] Ministry of Health, (Milk and Dairies, England), 1938, No 216 H.M Stationery Office

milk submitted to low-temperature pasteurisation as defined in the official order.

"4. That such pasteurisation does not materially interfere with the nutritive value of the milk.

"The College, whilo realising tho importance of milk heing produced from cows free from infection, and under conditions of cleanliness, recommends :—

"(*a*) That local sanitary anthorities should be given the power to require that milk sold within their areas should be pasteurised nnder official control.

"(*b*) That steps should be taken to permit of the pasteurisation and sale, as such, of milk from tuberculin tested herds.

"(*c*) That, in areas where adequate pasteurisation is at the moment impracticable, milk should be boiled before use."

In short, milk which has not been boiled (scalded) or pasteurised, should not be given to infants or children.

VITAMINS

The influence of vitamins in nntrition and scientific feeding is now firmly established. From a practical feeding point of view, some knowledge is essential of Fat Soluble A, Water Soluble B and Water Soluble C, and most important of all perhaps is Fat Soluble D.

Fat Soluble A is essential for adequate growth, and it has been shown [1] that it also protects against infections. It is found in nature dissolved in animal fats (see Table III.), but is absent from vegetable ods. Its absence leads to xerophthalmia, keratomalacia, and to an increased susceptibility to bacterial infections, more especially of the bronchi and intestine. It is present in milk, butter and most abundantly in cod- and halibut-liver oil ; it is also possible to get margarine which has had the vitamins added. It is not destroyed by the ordinary scalding of milk, and it is unlikely that any infant fed on modern

[1] Green, H. N , and Mellanby, E. : "Vitamin A as an Anti infective Agent," *Brit Med Journ* , No. 3537, October 20th, 1928, p 691.

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"The College, while realising the importance of milk being produced from cows free from infection, and under conditions of cleanliness, recommends :—

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methods will suffer from a deficiency of this vitamin. In the preparation of artificial foods and dried milk this vitamin is not entirely destroyed.

Water Soluble B has some influence upon growth and weight. There are really two vitamins included under this heading. (1) The anti-neuritic factor (B_1), the absence of which leads to polyneuritis; (2) the anti-pellagra factor (B_2), the absence of which in rats leads to a syndrome resembling pellagra. Vitamin B is found in meat and vegetables, and most abundantly in yeast preparations like Marmite (see Table III.). It is also present in milk, and is not destroyed by scalding. The absence of Vitamin B_1 produces beri-beri, a disease unknown in the British Isles.

The absence of *Water Soluble C* from the diet results in scurvy. This vitamin is present in fresh vegetables and fruits in varying amounts, and also in milk in small quantities (see Table III.). It is partially destroyed by heating and by most of the methods used in preparing artificial infants' foods, the completeness or otherwise of its destruction depending on the temperature used and the exposure to air and oxidation. The repeated heating of milk at the different stages of its transport from the farm to baby's bottle may result in the complete absence of any antiscorbutic factor in the infant's diet. Wherever an infant is fed artificially, it should be given fresh fruit or turnip juice, two or three teaspoonfuls daily.

Of recent years the Vitamin "C" has been isolated, and is now sold as "Ascorbic Acid" (Allen and Hanbury) in tablet form. The dose suggested is 1 tablet (0·005 gm.) in each feed, or 500 units once daily. In infants who cannot tolerate fresh fruit juice, and in an actual case of scurvy, where a large dose is required over a short period, this form of Vitamin C will be found useful.

Vitamin D. It was thought at one time that the absence of Fat Soluble A from the diet was responsible, in part at least, for the production of rickets. It is now known that animal fats contain another vitamin in close association with A, which is called *Vitamin D.* If this

TABLE VI DRIED MILKS WITH A LOW FAT CONTENT

Name of Dried Milk.	Water Per cent.	Protein Per cent.	Fat Per cent.	Carbohydrate Per cent.	Caloric Value of One Ounce	Remarks
Cow and Gate half cream	2 5	20 0	15 0	53 0	—	A half-cream dried milk modified by the addition of lactose
Cow and Gate 'special' half cream	2 5	30 3	10 5	43 8	133	No added sugar
Cow and Gate (skimmed)	3 0	35 5	0 8	52 8	108	
Glaxo (half cream)	2 0	31 0	16 5	43 0	131	
Trufood (half cream)	1 85	32 0	13 80	45 1	130	
Trufood (skimmed)	2 8	34 0	1 1	54 85	109	
Dryco	3 0	32 0	12 0	46 0	123	
Klim (skimmed)	2 o	38 0	1 5	50 0	107	
Horlick's Malted Milk	2 5	14 5	8 03	70 99	121	The product resulting from the drying together of fresh milk and the extracts of malted barley and wheat
Hooker's Malted Milk	1 5	14 0	9 2	71 8	120	Do do
Allenbury's half cream food	3 0	11 8	8 3	73 8	—	
Allenbury's sweet whey	2 0	13 0	1 0	75 0	104	Dried whey
Seeway	1 0	13 0	1 0	76 0	109	Do do
Caseo	5 50	88 0	2 0	—	110	A calcium caseinate product made from milk.
Ambrosia (half cream)	2 10	27 9	17 6	45 85	133	
Frailac (Cow and Gate)	1 7	10 8	13 0	71 6	128	

It has been suggested that these preparations are deficient in the vitamin Fat Soluble A and D and Water

TABLE V COMPOSITION OF THE BETTER KNOWN FULL-CREAM DRIED MILKS

Name of *Dried Milk*	Water *Per cent*	Protein *Per cent*	Fat. *Per cent*	Carbohydrate *Per cent*	Calorie Value of One Ounce	Remarks.
Glaxo (full cream) (*Oster milk*, No 2)	2 4	22 9	25 5	42 5	147	Dried milk with milk sugar, cream fat, Vitamin D and iron added
Trufood (full cream)	1 2	27 0	20 0	39 0	150	Pure dried milk with the addition of lactose
Dorsella	2 5	25 2	28 3	39 35	150	Do, with the addition of iron
Neave s Milfo	4 0	22 92	27 0	39 62	148	Do do
Cow and Gate (full cream)	2 5	26 6	27 3	37 6	151	Pure dried milk.
Haemolac	2 4	26 6	27 2	37 5	147	Contains 31½ grains of iron and ammonium citrate per lb of dried milk.
Lacta	3 6	26 25	29 0	37 64	148	Pure dried milk
Milkal	1 5	26 05	29 0	37 64	155	Do do
Ambrosia	1 7	26 4	29 0	37 10	155	Do do
Klim (full cream)	1 5	26 7	28 0	38 0	153	Do do
Virol and milk	2 7	26 5	28 0	37 5	156	Composed of malt extract eggs marrow fat, red bone marrow and the salts of lime and iron with the addition of dried milk.
Ferrolac	—	24 0	26 5	38 5	144	A dried milk food designed for the treatment of nutritional anæmia containing vitamin D and 1 000 parts of iron *per million*.

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TABLE VI DRIED MILKS WITH A LOW FAT CONTENT

Name of Dried Milk	Water Per cent	Protein Per cent	Fat Per cent	Carbohydrate Per cent	Calorie Value of One Ounce	Remarks
Cow and Gate half cream	2 5	20 0	15 0	53 0	—	A half-cream dried milk modified by the addition of lactose
Cow and Gate 'special' half cream	2 5	30 3	16 6	43 8	133	No added sugar
Cow and Gate (skimmed)	3 0	35 5	0 8	52 8	108	
Glaxo (half cream)	2 0	31 0	16 5	43 0	131	
Trufood (half cream)	1 85	39 0	13 86	45 1	130	
Trufood (skimmed)	2 8	34 0	1 1	54 65	109	
Dryco	3 0	32 0	12 0	46 0	123	
Klim (skimmed)	2 5	38 0	1 5	50 0	107	
Horlick's Malted Milk.	2 5	14 5	8 03	70 99	121	The product resulting from the drying together of fresh milk and the extracts of malted barley and wheat
Hooker's Malted Milk	1 5	14 0	9 2	71 8	120	Do do
Allenbury's half cream food	3 0	11 8	8 3	73 8	—	
Allenbury's sweet whey	2 0	13 0	1·0	75 0	104	Dried whey
Secway	1 0	13 0	1 0	76 0	109	Do do
Casco	5 50	88 0	2·0	—	110	A calcium caseinate product made from milk.
Ambrosia (half cream)	2 10	27 9	17 6	45 85	133	
Frailac (Cow and Gate)	1 7	10 8	13 0	71 6	128	

It has been suggested that these preparations are deficient in the vitamin Fat Soluble A and D and Water

TABLE V COMPOSITION OF THE BETTER KNOWN FULL-CREAM DRIED MILKS

Name of Dried Milk	Water Per cent	Protein Per cent.	Fat Per cent.	Carbohydrate Per cent	Calorie Value of One Ounce	Remarks
Glaxo (full cream) (Oster milk No 2)	2 4	22 9	25 5	42 5	147	Dried milk with milk sugar, cream fat, Vitamin D and iron added
Trufood (full cream)	1 2	27 6	26 0	39 0	150	Pure dried milk with the addition of lactose
Dorsella	2 5	25 2	28 3	38 35	150	Do with the addition of iron
Neave s Milfo	4 0	22 02	27 0	39 62	148	Do do
Cow and Gate (full cream)	2 5	26 6	27 3	37 6	151	Pure dried milk.
Haemolac	2 4	26 5	27 2	37 5	147	Contains 31½ grains of iron and ammonium citrate per lb of dried milk
Lacta	3 6	26 25	26 05	37 64	146	Pure dried milk.
Milkal	1 5	26 05	29 0	37 64	155	Do do
Ambrosia	1 7	26 4	29 0	37 10	155	Do do
Klim (full cream)	1 5	26 7	28 0	38 0	153	Do do
Virol and milk.	2 7	26 5	28 0	37 5	156	Composed of malt extract, eggs marrow fat red bone marrow and the salts of lime and iron with the addition of dried milk.
Ferrolac	—	24 9	26 5	38 5	144	A dried milk food designed for the treatment of nutritional anæmia containing vitamin D and 1000 parts of iron per million.

Soluble C, and so their use may cause rickets and scurvy It is certain, however, that the destruction of vitamins by drying is not complete, and the danger is easily overcome

TABLE VI DRIED MILKS WITH A LOW FAT CONTENT

Name of Dried Milk	Water Per cent	Protein Per cent	Fat Per cent	Carbohydrate Per cent	Calorie Value of One Ounce	Remarks
Cow and Gate half cream	2 5	20 0	1o 0	58 0	—	A half-cream dried milk modified by the addition of lactose
Cow and Gate special half cream	2 5	30 3	16 5	13 8	133	No added sugar
Cow and Gate (skimmed)	3 0	35 5	0 8	6° 8	108	
Glaxo (half cream)	2 0	31 0	10 5	43 0	131	
Trufood (half cream)	1 85	32 0	13 86	45 1	130	
Trufood (skimmed)	2 8	34 0	1 1	54 8..	109	
Dryco	3 0	3° 0	12 0	46 0	1°3	
Klim (skimmed)	2 5	38 0	1 5	50 0	107	
Horlick's Malted Milk	2 5	14 5	8 03	°0 99	1°1	The product resulting from the drying together of fresh milk and the extracts of malted barley and wheat
Hooker's Malted Milk	1 5	14 0	0 2	71 8	1°0	Do do
Allenbury's half cream food	3 0	11 8	8 3	73 8	—	
Allenbury's sweet whey	2 0	13 0	1 0	°5 0	104	Dried whey
Seeway	1 0	13 0	1 0	°6 0	109	Do do
Casec	5 50	88 0	2 0	—	110	A calcium caseinate product made from milk
Ambrosia (half cream)	2 10	2° 9	17 6	4.. 8..	133	
Frailac (Cow and Gate)	1 °	10 8	13 0	71 6	1°8	

by the addition of cod- or halibut liver oil and fruit juice to the infant's diet

The great disadvantage in prescribing dried milks lies in the fact that it is not so economical, and where instructions given by the manufacturers are followed out without any variation for the individual, the result is too often an overfed baby Many of the troubles in the feeding of the infant arise from the difficulty which is often seen in the digestion of fat and of protein We have already said that the drying of milk is a help in the latter case, and it is now possible to give a dried milk which is prepared from a skimmed milk or from one in which varying proportions of the fat have been removed Those dried milks are indicated in the presence of fat intolerance

In Table VI will be found the most commonly used dried milks with a modified fat content, together with their composition

The question whether it is necessary or desirable to *humanise* cow's milk—*i e*, to modify the composition of the milk to that of breast milk—will be discussed later Several dried milks are now sold which, on the addition of 1 drachm of the powder to 1 oz of water, approximate closely to the composition of breast milk The common ones we give in Table VII The cost of these preparations is, of course, greater than that of ordinary dried milks

Artificial Feeding in the Tropics On the whole dried milk is preferable The elements of the diet which the infant does not readily tolerate under these climatic conditions are (1) fat and (2) sugar This fact has been noted by commercial firms, and they have therefore manufactured a special brand for export to tropical countries In looking at the analyses, it will be seen that they are lower in fat content than the usual brand Less sugar is required in these warm climates than would be required with a higher fat content in the brands sold for use in the British Isles Among those firms manufacturing a special export or tropical food are the makers of Glaxo and of Cow and Gate, the analyses of which appear on p 52, but any of the dried milks with a low fat content

TABLE VII SHOWING THE COMMONER "HUMANISED" DRIED MILKS AND THEIR COMPOSITION

Name of Dried Milk.	Water Per cent.	Protein Per cent.	Fat. Per cent.	Carbohydrate. Per cent.	Calorie Value of One Ounce.	Remarks
Allenbury's No 1	1 2	10 3	18 5	63 4	128	A dried milk from which some casein has been removed, soluble albumen, lactose and cream added. To be diluted six times instead of the usual eight Also contains dextrin maltose
Allenbury's No 2	1 7	11 4	17 5	62 7	130	Has some malted flour added to the above and contains added Vitamin D (Calciferol) No starch present To be diluted six times instead of the usual eight
Cow and Gate Humanised	2 0	13 6	20 5	64 7	—	A roller milk powder humanised by the addition of cream and lactose
Lactogen (Nestlé's)	2 0	16 2	25 0	53 3	140	A dried milk, the protein content of which has been reduced by the addition of cream and lactose
Sunshine Glaxo (Oster Milk, No. 1)	2 0	17 0	20 0[4]	66 0	137	A modified dried milk, with added lactose, Vitamin D and iron
Humanised Trufood	1 4	11 8	28 9	52 3	155	Dried milk in which the ratio of the proteins has been adjusted to the breast milk standard with the *addition of lecithin* and other necessary ingredients
Mellin's Lacto	3 22	17 7	13 66	61 6	129	Dried milk with the addition of Mellin's food.

TABLE VII—*continued*

Name of Dried Milk.	Water Per cent.	Protein Per cent.	Fat Per cent.	Carbohydrate Per cent	Calorie Value of One Ounce.	Remarks.
S.M.A.	1 0	9 0	28 0	53 0	150	Dried milk from which some casein has been removed, lactose and special fat added
Humanised Ambrosia	2 4	15 9	24 0	55 5	152	Modified dried milk with added cream and lactose
No 1 Ambrosia	2 0	16 4	20 0	67 6	—	Dried milk with modified cream content with addition of Vitamin D
Humanised Dorsella	2 9	12 38	25 93	55 62	150	
Modilac (Cow and Gate)	2 0	18 6	19 0	59 3	—	A full-cream milk powder containing dextrose and dextrin.

as given in Table VI, such as Dryco, would be suitable for use in the tropics Some firms, such as the makers of Lactogen, pack their product specially for export, and they are therefore widely popular in the tropics

Glaxo (for Export)		*Cow and Gate* (for Export)	
Moisture	2 5 per cent	Moisture	2 5 per cent.
Fat	20·0 ,,	Fat	18 5 ,,
Carbohydrate	46·0 ,,	Proteins	27 0 ,,
Protein	24 5 ,,	Lactose	39 1 ,,
Ash	5 5	Cane sugar	6 5 ,,
Calorie value of 1 oz = 135		Ash	6·4 ,,
		Calorie value of 1 oz = 136	

"Certified" milk and cream for ocean voyages can be obtained from the Walker Gordon Laboratories, 54 Weymouth Street, London, W 1, who specialise in the supply of fresh milk for travellers

STARCHY PROPRIETARY FOODS

Apart from the preparations already discussed under the headings of dried milks and their modifications, many starchy foods are now offered as additions to cow's milk

in the artificial feeding of infants. The following are some of the common ones in use in this country, the analyses having been obtained from various sources, mainly from the manufacturers themselves. *It must be understood that the analyses represent the dried preparation which, when made up by the addition of milk and water, is modified so that the excess of sugar and starch is not so marked.* The protein (P.), fat (F.), and carbohydrate (C.) only are mentioned in percentages, the ash content and moisture supplying the remaining figures.

COMPOSITION OF PROPRIETARY FOODS

Allenbury's Malted Food, No. 3. (P.), 9·8; (F.), 1·0; (C.), 84·2. A mixture of wheat flour and malt. When prepared according to directions, it still contains some unaltered starch. Designed for children above the age of six months. One tablespoonful (about 1 oz.), a teaspoonful of sugar, and three tablespoonfuls of cold water; mix, and add ½ pint of boiling milk and water (equal parts). Calorie value of 1 oz. = 115.

Allenbury's Cereal. (P.), 13·5; (F.), 5·8; (C.), 75·2. A crisp cereal food, taken with milk or cream containing Vitamins B_1, B_2, and D, with Calcium as CaO, 1·03 per cent., Phosphorus, 1·21 per cent. and Iron 33 parts per million. 1 oz. = 120 calories.

Allenbury's Milk Food with Additional Iron. This food contains iron equal to 900 parts per million.

Arrowroot. (P.), 0·1; (F.), 0·02; (C.), 84·45.[1] Made from the starch of the root of a West Indian plant (*Maranta arundinacea*). Calorie value of 1 oz. = 101.

Benger's Food. (P.), 12·2, (F.), 0·9; (C.), 80·3. A mixture of wheat flour and pancreatic extract. When prepared according to directions, most, but not all, of the starch is converted into soluble forms. The protein is also partially digested as well as that of the milk used in mixing it. One tablespoonful (about 1 oz.) and four tablespoonfuls of cold milk, then add ½ pint of boiling milk and

[1] Campbell, John, *Lancet*, August 10th, 1929

TABLE VII—*continued*

Name of Dried Milk	Water Per cent.	Protein Per cent.	Fat Per cent.	Carbohydrate. Per cent.	Calorie Value of One Ounce	Remarks
S M.A	1 0	9 0	28 0	68 0	156	Dried milk from which some casein has been removed; lactose and special fat added.
Humanised Ambrosia	2 4	15 0	21 0	55 5	152	Modified dried milk with added cream and lactose
No 1 Ambrosia	2 0	16 4	20 0	57 6	—	Dried milk with modified cream content with addition of Vitamin D
Humanised Dorsella.	2 0	12 38	25 93	65 62	150	
Modilac (Cow and Gate)	2 0	18 6	19 0	56 3	—	A full-cream milk powder containing dextrose and dextrin

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Carbohydrate	46 0	,,	Proteins	27 0	,,
Protein	24 5	,,	Lactose	39·1	,,
Ash	5 5		Cane sugar	6 5	,,
Calorie value of 1 oz = 135			Ash	0·4	,,
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[1] Campbell, John, *Lancet*, August 10th, 1929

water, set aside in a warm place for fifteen minutes, then bring to the boil Calorie value of 1 oz = 113

Berina Builder. (P), 8 02, (F), 0 75, (C), 87 31 A preparation consisting of a mixture of dextrinised wheat flour and lactose to be added to milk

Berina Malted Milk Food. (P), 20 35, (F), 15 77, (C) 56 92 Made from whole cream milk, sugar of milk, cream of wheat and extract of malt Prepared with the addition of water

Chapman's Whole Wheat Flour (P), 0 4, (F), 2 0, (C), 79 3 A finely ground wholemeal flour Not much superior in nutritive value to ordinary "household" flour Starch entirely unaltered Calorie value of 1 oz = 112

Cream of Rice (Groult's) (P), 6 9, (F), 0 3, (C), 80 0 This is a patent food containing a high proportion of starch Calorie value of 1 oz = 105

Cream of Wheat (P) 11 81, (F), 2 40, (C), 72 40 Made from the granulated endosperm, or kernel, of wheat Calorie value of 1 oz = 108

Daltose (Cow & Gate) A mixture of carbo hydrate containing maltose and dextrose, etc Its composition per cent is moisture 5, maltose and dextrose 50, dextrins 37, calcium lactate 2, Vitamin D 2000 international units per lb

Farex (Glaxo) (P), 14 5, (F), 3 5, (C) 71 5 A preparation requiring no cooking containing wheat flour 53 per cent, Midlothian oat flour 18 per cent, maize flour 10 per cent, wheat germ 15 per cent, dried yeast, bone meal and vitamine concentrates, the whole mixture being subjected to a "solubilising" process to increase the digestibility of the contents Calorie value of 1 oz = 110

Glax-Ovo (P), 18 3, (F), 13 3, (C), 62 2 A preparation consisting of milk solids, malt extract, flavoured with chocolate and containing added vitamin D Calorie value of 1 oz = 133

Lacto-Veguva (P), 16, (F), 15, (C), 05 A milk food combining, in dried form, milk and the juices of vegetables, supplemented by the addition

of carbohydrates, proteins, and lipoids, and adequate sources of Vitamins B and D.

Maltosan. (P.), 9·1; (F.), 0 54; (C.), 85·19. A shiny powder, containing in desiccated form all the elements of malt soup except the milk and the water (*i.e*, wheat flour, malt extract, with a solution of carbonate of potash). To prepare 1 pint of soup take ⅔ pint of water, ⅓ pint of cow's milk, and 2½ oz. of Maltosan. Pass through a strainer and beat quickly, stirring all the time. Calorie value of 1 oz. = 115.

Mellin's Food. (P.), 10·3; (F.), 0·2; (C.), 80·4. A completely malted food. All the carbohydrate is in a soluble form. May be regarded as a desiccated malt extract. Half a tablespoonful, ¼ pint of milk and ¼ pint of water for a child under the age of three months. Calorie value of 1 oz. = 109.

Neave's Cereal Food. (P.), 14·59; (F.), 2·13; (C.), 78 0. A purely cereal preparation. Calorie value of 1 oz. = 116.

Nestlé's Milk Food. (P.), 14·5; (F.), 6·15; (C), 77·2. A mixture of desiccated Swiss milk, baked wheat flour and cane sugar (27 per cent.). Contains about 18 per cent. of starch. Calorie value of 1 oz. = 126.

Ovaltine. (P.), 13·2; (F.), 7·0; (C), 67·9. A concentration of the nutritive constituents of malt, milk, and eggs, flavoured with cocoa, and issued in the form of light, readily soluble granules. Contains neither starch fibre nor husks of grain. Calorie value of 1 oz. = 120.

Pablum. (P.), 14·8; (F.), 3 00; (C.), 71·4. Composed of wheatmeal, cornmeal, rolled oats, wheat-germ, alfalfa, yeast, and edible bonemeal. Calorie value of 1 oz. = 120.

Ridge's Food. (P.), 12·13; (F.), 2·71; (C.), 79·72. A baked flour, containing only 3 per cent. of *soluble* carbohydrates, the remainder being starch. Recommended to be made with milk and water. Calorie value of 1 oz. = 116.

Robinson's Patent Barley. (P.), 7·2; (F.), 1·35; (C.), 81·3. Ground pearl barley, poor in every element

except starch and mineral matter Calorie value of 1 oz = 109

Robinson's Patent Groats. (P), 12 25, (F), 7 3, (C), 72 4 Ground oats from which the husk has been removed Rich in protein and mineral matter Calorie value of 1 oz = 121

Ryvita Crispbread (P), 11 6, (F), 1 3, (C), 74 8 Made in England from crushed whole rye grain Calorie value of 1 oz = 104

Savory and Moore's Food (P), 12 6; (F), 1 5, (C), 76 8 Composed of wheat flour with the addition of malt and diastase When prepared according to the directions, most, but not all, of the starch is converted into soluble forms (chiefly maltose and malto dextrins) One or two tablespoonfuls (equals from 1 to 2 oz) to be mixed with two or three tablespoonfuls of cold milk or milk and water, and ½ pint of boiling milk or milk and water to be added Calorie value of 1 oz = 111

Scott's Oat Flour. (P), 6 7, (F), 5 0, (C), 78 2 A fine oat flour Starch unaltered Calorie value of 1 oz = 118

Sister Laura's Food (P), 20 96, (F), 2 64, (C), 75 27 A food prepared from wheat starch, intended to be added to undiluted milk Calorie value of 1 oz = 123

Soya Bean Flour[1] [2] (P), 44; (F), 20, (C), 14 A flour with a very high food value, especially protein, and a high vitamin content, made from the Soya bean Calorie value of 1 oz = 124

Veguva (P), 9 63, (F), 2 90, (C), 77 24 A dried mixture of spinach, carrots and tomatoes, rich in Vitamins A, B and C (the latter not destroyed by drying) The vehicle used is a mixture of starch and its various cleavage products obtained by diastatic disintegration To be used as a substitute for home made vegetable broth Calorie value of 1 oz = 112.

[1] Stearn, G *Am J Dis Ch*, Vol. 46, p 7, 1933, "Soya Bean in Infant Feeding"

[2] Hill and Stuart *J.A.M.A*, Vol. 93 p 985, 1929, "Soya Bean in Milk Idiosyncrasy"

Virol. (P.), 7·50; (F.), 11·60; (C.), 56·33. Composed of marrow fat, glycerine extract of red bone marrow, eggs, salts of lime, etc., malt extract, and the juice of fresh lemons.

Vita-Weat. (P.), 11·52; (F.), 7·66; (C.), 74·77. Made in England from whole wheat. Calorie value of 1 oz. = 127.

When a proprietary food is used the greatest care must be taken that it is not given in excess. If the proportion of starch be too high a flabby pale infant results, with a low resistance to infection (see p. 136, Starch Dyspepsia). Many of the proprietary foods are deficient in vitamins, and therefore cod-liver oil and fruit juice should invariably be added. The baby who will not tolerate sugar when this is given as cane sugar or lactose will often take an adequate amount of carbohydrate when given a preparation containing a mixture of dextrins and maltose (partly digested starch), or again may fail to gain weight on simple milk mixtures and will thrive at once when some starchy food is added to the diet. At the period of weaning a proprietary food may initiate with success the first attempt to give more than milk. In later chapters we shall indicate the difficult cases of feeding which may be expected to improve on the use of proprietary foods.

CHAPTER IV

ARTIFICIAL FEEDING

The essential problem of the whole of artificial feeding is to modify cow's milk so that the infant will thrive on it as well as it does on breast milk.[1] This is not accomplished necessarily by making cow's milk approximate to breast milk in its composition, but the aim is to make it act as adequately as the mother's milk.

There are certain fundamental *differences between* cow's milk and breast milk which can never quite be overcome. Breast milk is fed directly to the infant, warm, and for all practical purposes sterile, and in the quantity demanded by the infant's metabolism itself. If the child demands more, the breast is more completely emptied and more is supplied, and if less is demanded the reverse occurs.

In artificial feeding on the other hand, many hours elapse between the drawing of the milk and its being fed to the infant. During this time milk must be cooled or boiled to preserve it. It is no longer sterile, but in many cases teems with bacteria, its casein and fat are difficult to digest and lastly, the most important difference is *that it is supplied to the infant in quantities determined* by paternal calculation and not by the infant itself.

In Table VIII will be found a comparison of the composition of human milk and of cow's milk.

In addition to the above substances present in the two milks which show great variations, there are the vitamins, Fat Soluble A and D and Water Soluble C, which prevent rickets and scurvy respectively. Attempts at modifying cow's milk by pre-digesting, heating, boiling or

[1] Brennemann, J.: "Abt's Pædiatrics" Vol. II. p. 622.

TABLE VIII. SHOWING THE COMPOSITION OF COW'S MILK AND THAT OF HUMAN MILK

	Cow's milk. Per cent	Human milk. Per cent
Water	86–87	88·05
Fat	4 00	3 50
Protein. . . .	3 50	1 25
Milk sugar . . .	4 50	7 00
Mineral salts . .	0 75	0 20

even diluting must interfere with the potency of these substances.

The question arises in artificial feeding as to whether it is essential to modify the composition of cow's milk to make it as near breast milk as possible. The answer to this, shortly, is that all attempts up to the present have failed to produce a food which the infant metabolises as well as it does breast milk. The primary aim, then, is that the artificial food should be metabolised as efficiently by the infant as breast milk, and this can often be accomplished by departing widely from breast milk standards. It is the casein and fat in cow's milk which tend to cause indigestion; this results mechanically from the presence of milk clots in the stomach and bowel. On the other hand, metabolic disturbances are probably set up by the fats and salts of the milk. An excess of protein ingested is dealt with by deamination and elimination as urea, excess of carbohydrate by increased oxidation and storage. Fat, however, when in excess, tends to interfere with the general health of the infant, causing "bilious attacks" and producing some of the changes known as acidosis.

The whole of the three food elements, protein, fat and carbohydrate, are acted upon by bacteria. If the proteins are in excess the intestinal flora is putrefactive, and the stools are said to be offensive and faecal in character. If, on the other hand, fermentative organisms predominate, *i.e.*, if the protein in the diet is low and the

fat and sugar relatively high as in breast milk, the stools are sour-smelling, slightly acid, not offensive, and like those of the breast-fed infant.

In the case of minor ailments in the infant the diagnosis of the cause of the upset may be difficult, because the symptoms arising from indigestion—the result of increased fermentation in the bowel or from a definite bowel infection by a pathogenic organism—may be indistinguishable. Again, it may be difficult to say in any case of indigestion which of the crude elements is primarily at fault. That a balance is necessary between the different food elements becomes obvious early in the experience of the pædiatrician. If much sugar is given little milk may be prescribed. If the milk is large in amount small amounts of sugar only can be tolerated. High fats and high sugar content should never be given in the same feed. Finally, after a bowel infection or an attack of indigestion the tolerance for all food elements is lowered.

CLINICAL IMPORTANCE OF FOOD ELEMENTS

The Fat. We have always believed that the fat is the most difficult element in the diet to digest. The emulsion of fat in cow's milk is less complete than in breast milk and its globules are in consequence much larger. The volatile fatty acids are eight times more common in cow's milk than they are in human milk, and perhaps this accounts to a certain extent for the tendency of cow's milk cream to "sour" in the stomach. It must be pointed out that an *excess of fat* may produce either diarrhœa or constipation—the stools may be loose, acid, and contain curds, or pale grey, formed and crumbly. An excess of fat in the feed of what are commonly called "rich milk mixtures" is a fruitful source of vomiting in infancy.

One observer[1] has brought forward proof that the fat leaves the stomach last and tends to give rise to extremely acid, sour-smelling stomach contents which produce vomiting. By a series of experiments he has

[1] Brennemann, J.: "Abt's Pædiatrics," Vol. II, p. 622

shown that the richer the food is in fat, the longer delayed is the stomach emptying time. We have no methods which are of practical value of making the fat of cow's milk more digestible, and therefore it remains the most difficult food element to modify and the one which perhaps causes the greatest trouble in artificial feeding.

The Proteins. In breast milk the proportion of soluble proteins (lactalbumen and lactglobulin) to casein is as two to one, in cow's milk the proportion of these elements is one to four: in other words, the protein of cow's milk is largely made up of casein. There is no difficulty in digesting the soluble or whey proteins lactalbumen and lactglobulin.

Casein (Curd). Acid and rennet acting on cow's milk produce a coagulation largely brought about by the casein. This is seen, of course, in the making of whey or junket. The breast-fed infant who vomits some time after food brings up soft, fine curds because of the small proportion of casein in breast milk. The bottle-fed baby, on the other hand, vomits large hard curds, especially if the feed is one of unboiled milk.

Curd formation may be modified by various methods:—[1]

1. By bringing milk to the boil in a double saucepan. This modifies the casein, and curd formation in the stomach is greatly diminished. Pasteurisation does not inhibit curd formation. Prolonged boiling destroys the vitamin content.

2. Dilution with Water. Diluting the milk with water causes the curds to be smaller and, since the digestion of the curds in the stomach occurs from the periphery, this digestion is aided.

3. Dilution with Cereal Waters. This method is even more effective in reducing curd formation than is dilution with water. The usual cereal water used is barley or oat water. It is suggested that the colloidal solution of cereal water surrounds the particles of casein and prevents their clotting together to form a large curd

[1] "Milk Curd, its Mechanism and Modification," Newton Kugelmass, *Arch. Dis. Childhood*, Vol XII, 1937, p. 35

4. Peptonisation. This is the most effective method of dealing with the casein, but it is complicated and expensive, and is not necessary for the modification of cow's milk in feeding healthy infants. The subject of peptonisation of milk will be referred to later in the chapter on the feeding of ill infants (see p. 82).

5. By the use of Dried or Condensed Milks. In the process of drying or condensing cow's milk the protein is in some way *modified so that* the curd produced *in the* infant's stomach is definitely smaller and softer than when fresh cow's milk is used.

6. By the use of Alkalies. These may be given as lime water (calcium hydroxide), sodium citrate, sodium bicarbonate or magnesium hydroxide (milk of magnesia). It is difficult to explain their mode of action, but it is thought that they displace the calcium from its combination with the casein (calcium caseinate), and that the resulting combination produces curds softer and smaller in size when acted on in the infant's stomach.

The indications that there is *too much protein in the diet* are :—

1. Indigestion with marked colic, and the feed vomited contains large hard curds.

2. Constipation. The stools tend to be green or may be yellow in colour. They contain the characteristic large, pale amber curds which do not appear greasy in character (see p. 123).

3. The infant fails to gain weight, looks lifeless, with a pale, muddy complexion, and the whole picture suggests that the infant is being poisoned.

The Carbohydrate. *Sugar.* Lactose or milk sugar is the only carbohydrate present in human or in cow's milk. The sugar may be reduced in quantity by diluting the milk or by the removal of the whey, as this contains almost the whole of the carbohydrate in solution.

In the practical feeding of children sugar is essential if the infant is to gain weight. It will be found that few infants can take more than 2 oz. (eight heaped teaspoonfuls) of added sugar in twenty-four hours.

The symptoms of sugar intolerance are those of frequent frothy, acid, scalding stools which rapidly excoriate the buttocks. As a rule, this indicates an active fermentation of the sugar by the organisms present in the intestine.

It is normal in breast-fed infants for fermentative organisms to predominate over putrefactive in the bowel, since the protein of breast milk is low and the sugar high. This accounts for the fact that the stool of the breast-fed infant is slightly acid and not offensive in odour.

The artificially-fed infant, on the other hand, is usually given larger quantities of protein, and so the putrefactive organisms predominate in the intestine. The characteristic stools are more formed, are alkaline, and tend to be offensive in odour.

Our aim in artificially feeding an infant is to give a feed which results in no excess of putrefactive over fermentative changes in the bowel, and when frequent and fermented stools are passed it should be taken that the sugar is being given to excess in the feeds. On the other hand, the infant who is constipated, whose stools are alkaline, and who is failing to gain weight, requires the sugar in the feed increased. By increasing the acidity of the bowel content by means of added sugar, the stools tend to become more frequent and constipation is relieved.

The question is often asked: "Is it necessary to use a special type of sugar in the artificial feeding of infants?" We think that for a healthy infant it is not necessary to order a special sugar; in fact, the ordinary cheap brown sugar may usually be given. Lactose has no special value when added to the feed, and many consider it to be less digestible than some of the cheaper sugars. When, however, we consider the case of the child who is prone to get indigestion, there is no doubt that in these conditions a mixture of dextrin and maltose is the most easily tolerated of all the carbohydrates. Such preparations as Mead's Dextrimaltose, Mellin's Food, Waader's Nutromalt and Karolac are mixtures of dextrins and

maltose, and may be given as the carbohydrate of choice to the artificially-fed infant where the question of expense does not arise. Horlick's Malted Milk, in virtue of the dextrimaltose it contains, is also useful in cases where there is a tendency to carbohydrate intolerance.

Polysaccharides, *e.g.*, starches, are digested in the upper part of the alimentary tract and the greater part of them is absorbed from the lower ileum. This delay in absorption allows some fermentation to take place. Monosaccharides, *e.g.*, glucose, are absorbed from the stomach, duodenum and upper part of the ileum. The chance of fermentation is accordingly lessened. "Dextrimaltose," however, is tolerated when other carbohydrates produce fermented stools.

Starch.[1] When a feed with a high sugar content is taken, digestion is rapid and the sugar absorbed quickly. It is found extremely useful in infant feeding—sometimes at an early age, and certainly when a child reaches 15 lb.—to give a proportion of the carbohydrate in the form of starch. The process of starch digestion is slower than that of sugar, and absorption takes place throughout the interval between two feeds. In many cases this appears to be of considerable advantage.

We are well aware that some authors state that starch is not digested by an infant under the age of six months. That this is a fallacy can readily be shown by following the blood-sugar curve of an infant when starch has been given by mouth. It will be seen that there is no essential difference between the blood-sugar curve so obtained and that after the infant has had a feed of glucose or some other sugar.

Some children who are unable to tolerate a full carbohydrate feed where the carbohydrate is present as sugar will be found to tolerate it when a certain proportion of starch is substituted. This fact has long been realised by the manufacturers of proprietary foods, and such foods as Allenbury's No. III., Ridge's Food, Robinson's Patent

[1] Paterson, Donald: "The Uses of Starch in Infant Feeding." *Practitioner*, 1921.

Groats and Barley, Robb's Biscuits, Neaves' Food, Sister Laura's Food, and many others, have proved successful in virtue of their starch content. A word of warning must, however, be given here. We still are not aware of all the factors in the production of such disturbances of nutrition in infancy as, for example, rickets, and it is thought that a predominance of starch may be responsible to a certain extent for some of these disorders. When used with care, starch is most helpful in the artificial feeding of infants and it has already been stated, as cereal water, starch performs a valuable function by preventing excessive curd formation (see p. 61).

Salts. *Calcium* salts in combination with casein are present in larger quantities in cow's milk than in human milk, whilst the reverse holds true for the salts of potassium and iron. *Phosphorus* is present in larger quantities in cow's milk, but less of it is present in an organic form, and this may explain its less complete absorption.

Iron is present in such minute quantities in cow's milk and human milk as to be inadequate for the child's needs, but during the last month of intra-uterine life a supply of iron is laid down in the liver of the fœtus. When pregnancy is interrupted prematurely the child is deprived of this store of iron and tends to become anæmic. One of the greatest arguments in favour of early mixed feeding is the fact that an iron deficiency exists. The giving of bone broth, meat juice and cereals which contain iron at an early age has thus a rational basis [1]

Since rickets may be produced by an *insufficient intake of calcium* in the food of the child, or, if it is on the breast, of the mother, it is important to see that the supply of this salt is adequate. This provides an argument against the too rigid humanising of cow's milk, since, by means of marked dilution to reduce the amount of casein present, the calcium salts may be reduced below the minimum necessary to prevent rickets. There is no doubt that the

[1] Some manufacturers of dried milk add iron to their preparations (see Ferrolac and Haemolac)

absorption and utilisation of salts from the breast milk is much more efficient than from cow's milk.

Water. The normal healthy infant requires about 2½ oz. of fluid per pound body weight per day. Part of this he obtains in the form of milk and the remainder must be given as added water. In summer time much more water than this is required for obvious reasons. If an adequate amount of water is not given to a child he tends to become constipated and to pass only a small quantity of highly concentrated urine, which stains the napkins.

In marked cases of *dehydration* the infant almost invariably runs a temperature. If water is withheld still further the child appears to be poisoned by its feed. As a cure for constipation in breast-fed babies additional water is useful. Feverish and vomiting children and infants with acute diarrhœa all require additional water. Water with a small amount of salt (½ drachm of salt to the pint), that is, half normal strength saline, when given by the mouth, is rapidly absorbed and retained. On the other hand, cases have been known where infants have been given too large quantities of water which has kept going an existing diarrhœa, and on the restriction of the fluid to more normal requirements the diarrhœa has ceased.

Methods of Artificial Feeding

Many methods of artificial feeding have been advocated in the past, and each has proved successful in a proportion of cases That no particular method has proved universally successful must be acknowledged. We propose to discuss some common methods which are used, and to suggest one method (5) whose great merit lies in its simplicity. It must again be emphasised that each individual case requires consideration and that the baby is *always the best judge as to whether it is receiving* adequate feeds

The methods of artificial feeding may be stated to be—

1. Whole Milk Feeding. This method has been practised successfully in various countries for many years,

and it has even been shown that premature infants could be reared successfully on whole boiled milk. A fact which is often forgotten is that the infant who is given a full-cream dried milk, such as Glaxo, Cow and Gate, or Ambrosia, when this is made up in the usual proportion, *i.e.*, a heaped teaspoonful, or measure, to an ounce of water, is virtually being fed on whole milk.

The arguments in favour of this method of feeding are :—

(*a*) A small concentrated feed of high caloric value can be given.

(*b*) Its preparation is extremely simple.

(*c*) The biological value of the protein is certain to be sufficient for the infant's needs.

The arguments against the use of whole milk are :—

(*a*) That it lacks the physiological balance of food-stuffs, *i.e.*, the protein is too high and the sugar too low. The latter deficiency, of course, may be easily corrected by adding sugar, and we have already given the methods for modifying the curd formation which would decrease the tendency to protein indigestion.

(*b*) When an infant is fed on breast milk it requires 2½ oz. per pound body weight per day. When fed on cow's milk with sugar added it requires only 1½ oz. per pound body weight and is, therefore, considerably short of fluid.

(*c*) The secretion of hydrochloric acid in the healthy infant's stomach is sufficient to digest adequately the protein present in breast milk, but is insufficient when whole cow's milk is given (see "Lactic Acid Milk," p. 76).

We consider that in the first three months of life, at least, the disadvantages of whole-milk feeding outweigh its advantages.

2. **Humanised Milk Method.** *Single Formula.* This method of artificial feeding depends on the use of a single formula, by means of which a mixture is made of cow's milk which is said to be adequate for all infants at all ages. The total quantity of mixture required for any infant is based on the known fact that a normal healthy infant

requires 2½ oz of breast milk per pound body weight per day. Knowing the weight of an infant, the total quantity of mixture for the day is calculated, *e g*, 1 10-lb baby requires 25 oz. (2½ oz. × 10 oz.) of mixture. This is made up of milk and water equal parts, the dilution which brings the protein of cow's milk to the level of that in human milk (2 per cent.). To each pint of the mixture 1 oz. of sugar is added—making the percentage of sugar about 7 per cent. Fat in the form of cream or cod-liver oil is also added to the mixture to make up any deficiency in this component.

The disadvantages of the method lie in the fact that—

1. By keeping the percentage of protein low the biological value of this constituent may fall below the needs of the infant.

2. The 50 per cent. dilution may result in giving a mixture which is too low in calcium content.

3. Although suitable for the first two months of an infant's life, when older the amount of mixture calculated as shown by weight requires the addition of so much carbohydrate in the presence of a low protein content that there is a grave risk of gastro-intestinal upset from the excess of sugar given. Thus a 12-lb baby by this method would be given 2½ × 12 = 30 oz. of mixture, and to this would have to be added 1½ oz of sugar. Most infants will not tolerate carbohydrate in this quantity daily unless the curd content of the feed be raised.

3. Percentage Feeding. This method is based on an attempt to modify cow's milk so that the percentage composition closely approximates to that of human milk. Cow's milk contains 4 per cent. of protein (or four parts per 100), whilst breast milk has only two parts per 100. The percentage mixture is made by adding water to cow's milk to dilute the protein and the adding of carbohydrate as milk sugar or as "Dextrimaltose." Fat in the form of cod-liver oil is also added. The quantity of the mixture to be given to the infant is calculated by estimating the number of "calories" it requires in the day, and knowing

the number of calories each ounce of the mixture will produce when metabolised by the infant. The Walker-Gordon Laboratories (54 Weymouth Street, London, W.1) supply feeds made up to any percentage ordered.

The addition of water to cow's milk may dilute it so that the protein is lowered to the same percentage as that found in human milk, but it is seen that the proportion of casein to lactalbumen remains unmodified. Again, the value of a protein depends ultimately on its amino-acids, and these obviously are not affected by the simple addition of water. Cow's milk protein is not, and never can be, a true substitute for human protein. When we know what amino-acid groupings and what proportions are essential for the adequate nutrition of infants, and when starting with cow's milk, we can so modify it that the amino-acid groupings correspond to those found in human milk, we shall then have some reason for calling such a feed "humanised" milk.

Accepting the fact, however, that humanised milk approximates to human milk in any given sample, can we always be sure that by following a given method of dilution and addition of fats and carbohydrate we always obtain the same definite composition? A study of the variation in the composition of cow's milk soon shows that *to carry out the method rationally elaborate analysis of* the cow's milk becomes an essential before an accurate humanised milk can be made from the daily sample. Even if these difficulties be overcome the question may be asked: "Is it necessary or desirable to perform elaborate modifications of the cow's milk in its preparation for the infant?" The answer is that we know of nothing in the baby's digestive powers which prevents its easily digesting and assimilating a mixture which contains a slight increase or decrease in the proteins, fats or carbohydrates.

4. *Caloric Feeding.* The term "calorie" means a unit quantity of heat

One gram of protein or of sugar yields about 4 calories, whilst 1 gm. of fat yields about 9 calories when utilised

by the body. Stated another way, 1 oz. of cow's milk is equivalent to 20 calories and 1 oz. of sugar is equal to 120 calories. It has been shown by many observers that the caloric requirements of infants vary according to their age, activity, state of nutrition, and the temperature of their environment—in fact, their caloric requirements are altered by those factors which modify the infant's metabolism.

It can readily be understood then that the caloric requirements of infants, even when healthy, are very variable, but it may be stated that a normal infant in the English climate requires about 40 to 45 calories per pound of body weight per day. Some underweight infants may require as much as 60 calories. It must be realised that the estimation of the number of calories required by an infant in the day can only be calculated roughly, and it is impossible without consideration of the above factors to use this method as more than a rough guide to control the artificially-fed infant. It has a use in preventing gross over- or underfeeding (see pp. 20 and 25).

5. Simple milk dilution with addition of Carbohydrate—the method of choice. Four methods of artificially feeding an infant on cow's milk have been given. Feeding on whole milk is simple, but the problem of the "casein clot" makes it undesirable, especially for the very young infant. The method of using a single formula (humanised) may result in a gastro-intestinal upset when the weight reached by the baby entails the use of large quantities of carbohydrate, and the calculations depending on the estimations of calories and the use of tables make the percentage method rather too complicated to carry out in general practice, unless assisted by a nurse who has had a special training in the subject.

The busy practitioner may ask then how is he to know whether an infant is being given too much or too little in its feeds, and are such feeds properly balanced—that is, do they contain approximately the right proportions of the various constituents? *We think the easiest way to approach*

baby $2\frac{1}{2} \times 12 = 30$ oz of fluid, in the twenty-four hours. The amount which an infant drinks will vary, of course, with the amount of fluid it loses by the bowel, by the kidneys and especially by the skin Infants readily get dehydrated in warm weather owing to increased perspiration, and this increased loss must be made good by allowing drinks of water between the feeds, but these latter must never be allowed to fall below what Nature allows, as shown by the amount of breast milk.

The fluid requirement of a healthy infant in the day is given by multiplying body weight in pounds by $2\frac{1}{2}$ oz.

Cow's Milk. An analysis of a large number of normal infants' feeds has shown that the baby will thrive well if the basis of its feeds consists of $1\frac{1}{4}$ oz. of cow's milk per pound body weight each day. An 8-lb. baby would need $1\frac{1}{4} \times 8$ oz or 14 oz. in the twenty-four hours, and as such an infant requires 20 oz ($2\frac{1}{2} \times 8$) of total

TABLE IX.A. METHOD OF FEEDING ON COW'S MILK BY SIMPLE DILUTION AND THE ADDITION OF SUGAR

Weight of Infant in Pounds.	Ounces of Cow's Milk	Ounces of Water	Level Teaspoonfuls of Sugar	Number of Feeds.
5	8	$4\frac{1}{2}$	5	6
6	$9\frac{1}{2}$	$5\frac{1}{2}$	6	6
7	11	6	7	6
8	14	$6\frac{1}{2}$	8	6
9	$15\frac{1}{2}$	7	9	6
10	17	8	10	5
11	$18\frac{1}{2}$	9	11	5
12	21	9	12	5
13	$22\frac{1}{2}$	$10\frac{1}{2}$	13	5
14	23	12	14	5
15	25	$12\frac{1}{2}$	15	5

fluid, 6 oz of water must be added. Dilution, as we have already noted, also entails the addition of sugar and fat. The latter is best given as one teaspoonful of cod-liver oil or one drop of halibut-liver oil three times daily before a feed and not mixed in the bottle. The additional sugar, as shown to be necessary, consists of

one level teaspoonful (1 drachm) for each pound body weight An 8 lb baby then would have eight level teaspoonfuls of sugar added to the day's feed, which contains 12 oz of cow's milk and 8 oz of water The feed for a 12 lb baby would consist of milk $1\frac{3}{4} \times 12 = 21$ oz, water 9 oz ($12 \times 2\frac{1}{2} = 30$ oz of total fluid) and sugar twelve level teaspoonfuls The total feed of 30 oz would be divided into five bottles, given at four hourly intervals, and before three of these feeds the infant would have a teaspoonful of cod liver oil, or one drop of halibut liver oil.

The milk requirement of a healthy infant in the day is given by multiplying the body weight in pounds by $1\frac{3}{4}$ *or and, in addition, it also requires one level teaspoonful of sugar for each pound weight per day* Put another way, the healthy infant requires $2\frac{1}{2}$ oz of a mixture of two parts of milk to one of water, with a level teaspoonful of sugar added for each of its pounds body weight per day

Full cream Dried Milk (Cow and Gate, Glaxo, Ambrosia, Dorsella, Lacta, Milkal etc, Table IX B) It will be remembered that one heaped teaspoonful or measure of a full cream dried milk dissolved in 1 oz of water reconstitutes 1 oz of cow's milk The amount of

TABLE IX B METHOD OF FEEDING ON FULL-CREAM DRIED MILKS WITH ADDED SUGAR

Weight of Infant in Pounds.	Full-cream Dried Milk in Drachms or Measures.	Water in Ounces.	Level Teaspoonfuls of Sugar	Number of Feeds
5	8	$12\frac{1}{2}$	5	6
6	$9\frac{1}{2}$	15	6	6
7	11	$17\frac{1}{2}$	7	6
8	14	20	8	6
9	$15\frac{1}{2}$	$22\frac{1}{2}$	9	6
10	17	25	10	5
11	$18\frac{1}{2}$	$27\frac{1}{2}$	11	5
12	21	30	12	5
13	$22\frac{1}{2}$	$32\frac{1}{2}$	13	5
14	23	35	14	5
15	25	$37\frac{1}{2}$	15	5

[1] Cow and Gate, Glaxo Dorsella, Lacta Milkal Ambrosia.

full cream dried milk necessary for normal progress has been *determined in a similar manner to cow's milk* It is found that the amount required is 1½ measures or drachms per pound weight daily As before, one *level* teaspoonful (*1 drachm*) of sugar must be added for each pound, and one half teaspoonful of cod liver oil or one drop of halibut liver oil also given three times in the day The fluid requirements are worked out as already given and the amount of dried milk dissolved in this An 11 lb baby needs $2\frac{1}{2} \times 11 = 27\frac{1}{2}$ oz of water, with 1×11 level teaspoonfuls of sugar in each twenty four hours

The dried (full-cream) milk requirement of a healthy infant in the day is given by multiplying the body weight in pounds by one and three fourths heaped teaspoonfuls, or measures and it also requires one level teaspoonful of sugar for each pound body weight per day

Humanised Dried Milk (Sunshine Glaxo, Allenbury s Nos I and II , Humanised Trufood Humanised Cow and Gate, etc Table IX c below) The need for dried humanised milks has already been discussed One heaped teaspoonful (1 drachm), or measure, of such a preparation when dissolved in 1 oz of water gives a mixture whose

TABLE IX c METHOD OF FEEDING ON HUMANISED DRIED MILKS

Weight of Infant in Pounds	Heaped Teaspoonfuls or Measures of Humanised Dried Milk [1]	Water in Ounces	Number of Feeds Daily
5	12½	12½	6
6	15	15	6
7	17½	17½	6
8	20	20	6
9	22½	22½	6
10	25	25	5
11	27½	27½	5
12	30	30	5
13	32½	32½	5
14	35	35	5
15	37½	37½	5

[1] Sunshine Glaxo, Humanised Trufood Allenbury s No I and No II Almata Humanised Cow & Gate

composition approximates to that of breast milk. Two and a half measures of humanised milk should be given for each pound body weight, and such should be dissolved in the amount of fluid necessary to give 2½ oz. for each pound body weight in the twenty-four hours. A 6-lb. baby would be given 2½ × 6 = 15 heaped teaspoonfuls, or measures, of the powder dissolved in 2½ × 6 = 15 oz. of water. No sugar is added, but small quantities of cod-liver oil or halibut-liver oil together with fresh fruit juice should be used to replace any possible lack of vitamins.

Condensed Evaporated Milk. If 20 oz. of water are added to 10 oz. (twenty tablespoonfuls) of an *unsweetened* condensed milk, *e.g.*, "Ideal," Libby's, etc., brand, together with three level tablespoonfuls of brown sugar, this gives 30 oz. of a suitable mixture for feeding an infant up to six months. A healthy infant needs 2½ oz. of breast milk for each pound body weight in the day, and, using this as a guide, the baby should be given a corresponding amount of this unsweetened condensed milk mixture.

The proportions of a *sweetened* condensed milk found necessary are: two level teaspoonfuls of the milk dissolved in 2½ oz. of water for each pound body weight per day. One to two tablespoonfuls of boiled cow's milk should be added to each feed.

Summary of Method of Food-calculation. This method may be summarised by stating that for each pound body weight a normal infant requires—

1. *Cow's milk* 1¾ *oz. with* 1 *drachm of sugar* (*one level teaspoonful*); *or*
2. *Dried milk* (*full cream*), 1¾ *drachms* (*one and three-fourths measures*) *with* 1 *drachm of sugar* (*one level teaspoonful*); or
3. *Dried milk* (*humanised*), 2½ *drachms, and no added sugar*; and any of these must be made up with water to give the child a total amount of fluid corresponding to 2½ oz. for each pound body weight in the twenty-four hours.
4. Unsweetened condensed milk, 2½ oz. of the con-

densed milk mixture (see p. 75) per pound body weight per day.

5 Sweetened condensed milk, two level teaspoonfuls in 2½ oz of water per pound body weight per day.

It will be seen that throughout the weight of the child has been used rather than any theoretical consideration of calorie requirements, and that no effort has been made to approximate the mixture closely to that of breast milk. The whole *regimen* has been based on the average results obtained by watching a large series of cases. The amounts given above are those on which healthy infants have been found to thrive well. It must be admitted that the greatest success in the use of "humanised milk" has been attained where it has been given in the first month or six weeks of life. Simple dilution with addition of carbohydrate may in a small proportion of cases in the first month prove too strong a mixture; in this case dilution must be carried somewhat further, but the same amount of milk and sugar should be used. Tables IX. A, B and C show the quantities of the constituents necessary when using this method for artificially feeding a healthy baby.

Other Methods of Modifying Cow's Milk

The methods already mentioned are commonly used in feeding the well infant. Certain further modifications of cow's milk may also be used, but are especially applicable to the feeding of ill infants, particularly those with digestive upsets, such as described in Chapter VII.

Lactic Acid Milk. The incubation of milk, to which has been added a culture of the lactic acid bacillus, for from six to twelve hours at 65° F. raises the acidity of the milk by fermenting the lactose. The effect of a decrease in the sugar content with an increase in the acidity renders less hydrochloric acid necessary for the digestion of such milk in the stomach.[1] [2] This food is useful in:

[1] "A Study of Gastric Acidity," Wills, Lucy, M.B., and Paterson, Donald, *Arch. Dis. Child.*, Vol. I., No. 4, p. 232.

[2] "The Acidity of the Gastric Contents of Infants," Marriott, W. McK., and Davidson, L. K., *Am. J. Dis. Ch.*, 1923, xxvi., 542.

1. *Premature Infants*, where the flow of gastric juice is not well established. It is claimed by some that lactic

	Lactiac (O and O)			Merrell Soule
	Full Cream	Half Cream.	Separated.	Full-Cream
	Per Cent.	Per Cen	Per Cent.	Per Cent
Fat . . .	25 5	15 5	0 7	28
Protein . .	25 0	28 3	33 0	28
Lactose . .	35 2	41-0	49 5	31
Mineral matter .	5 6	6 3	7·4	6
Water . .	2 5	2 4	3 1	3
Free lactic acid .	6 3	6 3	6 3	4
	Per Ounce	Per Ounce	Per Ounce	Per Ounce
Calorie value .	145	129	104	116

acid milk is the most efficient artificial food in prematurity when no breast milk is available.

2. *Fermentative Diarrhœa.* The symptoms of this condition are given on p. 108. The high protein and low sugar composition of lactic acid milk prevent to some extent fermentation in the intestine.

3. *Acute Gastro-Enteritis* may be treated with success by this method.

A Simple Method of Preparation. The use of cultures of lactic acid bacilli render this method somewhat unpractical except in children's hospitals, but it has recently been shown that lactic acid milk may easily be prepared by the simple addition of the acid to sterilised milk. The results obtained have been comparable with those seen when the older method of fermentation was used.

The method now adopted [1] is to take 1 pint of skimmed cow's milk, which has been boiled and allowed to cool, and to add to this up to forty-five drops of lactic acid (B P.) drop by drop, stirring well all the time. Sugar is added, and the mixture may be given in full strength or after dilution. It must not be warmed to more than blood heat before being given to the infant, however, or it will curdle.

[1] Method described by Marriott

During the summer weather, and especially if there is a long interval between the production of the milk and the receipt by the consumer, the natural acidity of the milk increases. Because of this the full quantity of lactic acid cannot be added to the milk without curdling, in fact, sometimes less than one-half or even one-quarter will turn the milk sour. It is because of this that *up to forty-five drops* per pint is suggested.

If any difficulty is experienced in following the above directions, the easiest method of preparing lactic acid milk is as follows :—

1. Make the infant's feed up from the boiled and cooled milk with the necessary water and sugar in the feeding bottle.

2. Warm this to blood heat, then add from one and a half to two drops of lactic acid (B.P.) for each ounce of cow's milk used in the feed, *e.g.*, a 7-oz. feed containing 5 oz. milk and 2 oz. water would have from seven to ten drops of lactic acid added.

3. Replace the teat on the bottle and feed immediately without further warming.

Lactic acid milk can be obtained from the Walker-Gordon Laboratories (54 Weymouth Street, London, W. 1), or from Messrs. L. A. Hindley, 119 Coniston Road, Bromley, Kent (Bulgolac). Of the dried lactic acid milk preparations the best known are "Lacidac," made by the Cow and Gate manufacturers (The West Surrey Central Dairy Company, Guildford), and that made by the Merrell-Soule Company (110 Cannon Street, London, E.C. 4), the analyses of which are given on p. 77.

Hydrochloric Acid Milk. In the treatment of infants with eczema or other forms of the allergic diathesis, hydrochloric acid milk is often considered to be of use. The method of preparation is as follows :—

1. The milk is boiled, cooled, and the skin removed. This skin is said to consist largely of lactalbumen, which has been held to be the constituent in milk responsible for the allergic phenomena.

2. Place in the bottle the required amount of the milk, add water and sugar, to complete the feed, and warm to a suitable temperature.

3. Now add, drop by drop, from one and a half to two drops of acid hydrochloric dil. (B.P.) per ounce of cow's milk in the feed, as described under Lactic Acid Feeding.

4. Do not warm further, but feed directly to the infant.

Allergilac. (F.) 15·15 per cent.; casein 24 0 per cent.; lactalbumen 1·0 per cent.; ash 6·7 per cent.; lactose 49 8 per cent.; moisture 3 0 per cent.; acidity value 27° pH value.

The Cow and Gate manufacturers now make Allergilac—a dried milk containing the necessary amount of lactic acid, and with the lactalbumen removed. This is claimed to be suitable in allergic conditions in infancy and childhood.

Buttermilk. In the British Isles buttermilk is not widely used, but both on the Continent and in America it is more easily obtainable, and its value is generally recognised. Buttermilk is that fluid which is left after the fat has been removed from cream by churning in the manufacture of butter, and its sourness is due to the presence of lactic acid. Its composition is approximately 2½ to 3 per cent. of protein, 0·5 per cent. of fat, and 3 to 4½ per cent. of carbohydrate. Its chief uses are in the diarrhœal diseases of infants, especially in those cases where fermentation has been marked. A very excellent dried brand, "Eledon," is prepared by Nestlé. This is a half-skimmed fresh milk inoculated with lactic acid organisms, and, after acidification has proceeded to the desired degree, it is dried by the spray process. The composition of the dry powder is as follows: butter-fat, 14 per cent.; protein, 30 per cent.; lactose, 39 per cent.; mineral matter, 7 per cent.; actic acid, 6 per cent.; residual moisture, 4 per cent. 1 oz. of "Eledon" yields 124 calories. For general use the dilution recommended is one part of "Eledon"

in 10 parts of water, and the metal measure enclosed with each tin holds $\frac{2}{5}$-oz., of "Eledon," which is sufficient to prepare 4 fl. oz. of acid buttermilk. Buttermilk is also obtainable fresh from the Walker-Gordon Laboratories (54 Weymouth Street, London, W.1).

Buttermilk Powder. A buttermilk powder is prepared by the Glaxo Laboratories which when reconstituted in accordance with the directions, gives a solution having a pH of 6·7. To make half a pint of buttermilk one ounce of Buttermilk Powder G.L. is mixed with sufficient water to make a smooth paste. Hot water is added up to the required volume, and the whole is mixed thoroughly. Analysis: moisture, 3·5 per cent.; fat, 5·5 per cent.; protein, 33·5 per cent.; lactose, 42·0 per cent.; ash, 7·5 per cent.; citrates, etc., 1·5 per cent.; lactic acid, 6·5 per cent. Calorific value per ounce = 102.

High Protein Feeding. Some infants on the breast do badly for no other reason than that the stools are too acid on account of the small amounts of the alkaline producing protein in breast milk (p. 31). When a little whole boiled cow's milk is given immediately after the breast feed this upset is corrected. It appears that certain infants require a high protein content in their feeds in order to thrive.

This fact has been used as an argument by those who always feed on undiluted cow's milk, but though it is true for some infants, it does not apply to the majority of healthy babies.

Both sugar and fat tend to cause fermentation and acidity of the bowel contents with more frequent stools and, perhaps, scalding of the buttocks. By raising the protein or curd in the feed the stools tend to become more alkaline and the bowels constipated. This explains the use of high protein *feeding in cases of fermentative* diarrhœa. Whole milk may be given in the treatment of this condition, or even a milk food with a still higher percentage of protein, *e.g.*, Mead's Protein Milk, Protein S.M.A. and Merrell Soulo Powdered Protein Milk, the analyses of which are:—

	Mead's Powdered Protein Milk	Merrell Soule Powdered Protein Milk	Protein S.M.A.
Protein	39 0 per cent	38 0 per cent	35 per cent
Fat	26 5 „	27·0 „	22 „
Carbohydrates	24·0 „	24 0 „	28 „
Ash	6·0 „	5 0 „	6 „
Free lactic acid	3 0 „	3·0 „	—
Calorie value per ounce	149	143	133

The addition of lactic acid to milk, as already stated, aids in the more complete digestion of the casein in the stomach, and where it is thought advisable in any case to use a mixture which contains an excess of protein it is best given in the form described above as lactic acid milk.

The preparation of protein milk is most conveniently carried out by the use of Casec (Mead, Johnson & Co), a powder which is shown on analysis to consist of 88 per cent of protein in the form of calcium caseinate One packet of this powder (½ oz) added to a quart of fluid, 1 pint of milk and 1 pint of water, raises the protein content about 1 per cent Two packets increase the protein 2 per cent , and so on A high protein milk can also be prepared to any desired protein concentration by the use of a soluble protein (Glaxo Laboratory), a sodium salt of casein containing 91 5 per cent of protein

Whey. Whey is made by precipitating the casein in milk A simple method is by adding two teaspoonfuls of rennet to 1½ pints of luke warm milk, and allowing this to stand until cold If the curd is now strained through muslin the whey will exude The composition of whey, according to Robert Hutchison,[1] is as follows —

Water	93 6 %
Protein	0 8 %
Fat	0 02%
Sugar	4 65%
Mineral matter	0 65%

[1] Hutchison R Food and the Principles of Dietetics, 6th ed p 132

A most convenient way of obtaining whey is by using the whey powder Seeway [1] (see Table VI, p. 49), which merely requires dilution with water. A glance at the composition will show that, beyond a very small quantity of protein, the chief constituent of whey is sugar, and where a bland, non-irritating and slightly nutritious drink is required whey may be given It may be considered useful following on an attack of acute indigestion in an infant, and should be replaced by one of the skimmed dried milks or skimmed lactic acid milk.

Peptonised Milk. There are a number of preparations on the market for peptonising (pre digesting) the protein of cow's milk. Among those better known are Benger's peptonising powders and liquor pancreaticus, but the principle of the various peptonising substances is the same The milk or milk and water is warmed to about blood heat and the active enzyme, either in powder or fluid form, is added The mixture is then allowed to stand for from twenty to thirty minutes, after which the whole is brought to a boil, the enzyme being in this way destroyed and further peptonisation prevented If the peptonising process is continued for longer than twenty or thirty minutes a slightly bitter taste is present

Peptalac is a preparation made by Cow and Gate Ltd. containing full-cream milk and dextrinised starch, which are subjected to the action of pancreatic enzymes for a given period of time The mixture is then dried, preserving intact the vitamin content of the original milk and leaving a powder in which 22 per cent. of the protein has been peptonised, and 25 per cent. of the starch converted to a soluble and easily assimilated form.

CHOICE OF FOOD

When the necessity arises to take the infant off the breast the practitioner is often asked to choose the best substitute for the natural food Below are given some of

[1] Made by Trufood Ltd., Lever House, E.C. 4

the advantages and disadvantages of the various substitutes for breast milk.

1. Cow's Milk [1] (boiled, scalded or pasteurised). One of the chief advantages is that cow's milk is less expensive than any other artificial food. The preparation is simple, and it can be freed from pathogenic organism by boiling, scalding, or pasteurising. By so heating, the curd is modified and made much more digestible. The disadvantages lie in the alteration in the taste, and in the possible destruction of vitamins. The addition of orange or tomato juice, and cod- or halibut-liver oil, eliminates the drawback of a possible vitamin deficiency.

2. Dried Milk (Full-cream Glaxo, Cow and Gate, Dorsella, Lacta, Ablkal, Ambrosia, Klim) The old prejudice against giving anything but fresh cow's milk has lately been modified by the success of modern dried milk. The advantages are that it is sterile, constant in quality, and, owing to the drying process modifying the protein, more easily digested. Dried milk is also easy to obtain, to keep, and to make up. Possible disadvantages are the absence of vitamins, but it has been shown that the vitamins are not entirely destroyed, and their deficiency can easily be made up by giving fruit juice and cod- or halibut-liver oil each day. Vitamin D is added by some makers to repair any deficiency. It is to be remembered that the cost of dried milk is greater than that of cow's milk. A measure or drachm of dried milk added to 1 oz. of water reconstitutes 1 oz. of cow's milk.

3. Humanised Dried Milk (Sunshine Glaxo, Allenbury's No. I., Humanised Trufood, Almata, S.M.A.). The advantages and disadvantages of these foods have already been discussed under heading (2). One drachm of these dried milks, when added to 1 oz. of water, approaches closely the composition of breast milk. Their cost is greater than that of the ordinary dried milk; and for the advantages and disadvantages, see section on "Single Formula Mixtures."

[1] Ogilvie, S. W., and Peden, O. D.: "Gastric Digestion of Raw and Boiled Milk in Infants," *B. M. J.*, July 14th, 1934.

tables given are based on the assumption that the baby has thrived normally and has reached *this normal* (expected) weight.

If the infant has made appreciably less or more than the normal progress in weight the quantities given will require to be modified upwards or downwards. Thus a doctor faced with the problem of feeding an infant of 10 lb., who by a simple calculation should be weighing 12 lb., must base his feeds on the weight of 12 lb. (expected weight), and not on that of 10 lb. (an underweight) He will discover that no satisfactory gain in weight will be achieved until he has done so. Again, if the baby should weigh 14 lb. when by consideration of its normal gain it should be weighing 12 lb. only, he must restrict the feeds to that of the 12-lb. baby. It must again be emphasised that individual babies differ in their food requirements, and that the progress of the infant in healthy gaining is the ultimate test as *to whether the quantities that have been prescribed* are the right ones.

Choice of Bottle. The bottle most commonly used is the *boat-shaped* bottle, which is manufactured by many firms such as Allenbury and Glaxo. At one end of the bottle is the teat, and on the other end a rubber valve. The advantages claimed for this pattern are that it is readily washed through and cleaned. Air passes through the valve, and thus it is not necessary to remove the teat from the infant's mouth to prevent a vacuum forming above the milk level, which tends to stop the outflow of milk through the teat. A great disadvantage arises, however, in that unless the valve is most scrupulously clean a small milk clot may seal the hole in the valve. This will result in the flow of milk diminishing, and repeated *sucking of the infant under such conditions* tends to flatten the teat in its mouth. The nurse can *readily recognise when the valve is not working* by noting that, on removal of the teat from the baby's mouth, a stream of bubbles rushes up through the milk. She should at once remove the valve and replace it by an efficient one.

Fig 2 —Soxh'et (upright) bottle and boat shaped bottle

[To face p 80

Fig 3—A variety of tents in common use

In the practical feeding of infants it is best to remove the valve altogether once the feed has been commenced.

Another disadvantage lies in the difficulty of sterilising and transporting feeds in a boat-shaped bottle because of the valve leaking. The substitution of a cork for the valve overcomes this difficulty.

The *upright* or *soxhlet bottle* is the one commonly used in hospital, and in those nurseries where it is found most convenient to make up in the morning the total feeds for the day. The great advantage of this type is the ease with which the feed can be sterilised in the bottle, and reheated by standing in a jug of warm water before the feed is given. It must be recognised, however, that greater skill is required in the use of an upright bottle, in that at very short intervals the teat must be removed from the baby's mouth in order to allow air to enter the bottle. If bubbles do not stream up through the milk, a vacuum will form above the surface of the milk, the teat will collapse, and the milk will cease to flow.

Soxhlet bottles cannot be washed through, but can be cleaned efficiently with a good bottle brush. Whatever types of bottles are used, extreme care should be taken to see that they are cleaned immediately after feeds, and kept fully immersed in clean water. The authors consider that a boat-shaped bottle without the valve is best.

Choice of Teats. The varieties of teats in common use are shown in the illustration (Fig. 3) facing this page. The short stumpy type resembling the human nipple is exemplified by the Ingram, Glaxo, and Allenbury's teats. The authors prefer this type for the normal healthy infant, as with this type there is little chance of the teat slipping too far back in the infant's mouth, thus causing retching and vomiting.

The soxhlet teat is extremely useful in the hands of a skilled nurse who recognises the danger of retching being readily induced by such a long teat being drawn too far into the baby's mouth.

by means of a fine sewing needle, the eye of which has been pressed into an ordinary cork The bottle containing the food is held teat downward, and the red hot needle is plunged through the tip of the teat This should be repeated until the required flow (about sixteen drops to the minute) is obtained The practice of making holes with safety pins and the points of scissors is to be condemned.

Getting up Wind Since every baby swallows air normally with its food, this procedure is invariably necessary, whether a baby be breast or bottle fed, and whatever is given from the bottle, even water or orange juice Consideration of the anatomy of the stomach shows the necessity for the infant to be held in an upright position, allowing the swallowed air to be emitted through the gullet The more placid and drowsy the infant is, the quicker and more completely this is brought about Sitting upright well supported on the nurse's knee, is the method of choice, gently swaying the baby back and forth from side to side Some infants bring up their wind best when placed well over the nurse's *left* shoulder Getting up the wind may take up to twenty minutes, and the nurse should never be satisfied until three or four separate rifts (windy pops) have occurred Wind not brought up will pass through the stomach with the food, accumulate in the bowel, and cause bursts of colic and screaming Every infant must be removed from the cot and held in the nurse's arms if the feed is to be administered properly The practice of propping a bottle on the pillow and allowing the infant to feed lying flat in its cot cannot be too strongly condemned

Preparing the Feed When the feed of choice is a *dried milk*, it is most convenient to make up each feed separately The dried milk is carefully measured by the scoop supplied in the tin, together with sugar, if prescribed Teaspoons differ enormously in capacity and are best avoided as measures when possible The dried milk is mixed to a paste with cold water, in a small measuring jug marked in ounces, and the required amount of hot water is added, and the whole stirred continuously until

FIG 4.—Note method of holding baby to bring up its wind

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FIG 5.—X ray showing stomach distended with wind after a feed.

Fig 6 —X ray of the same infant shown in Fig 5 after having brought up its wind

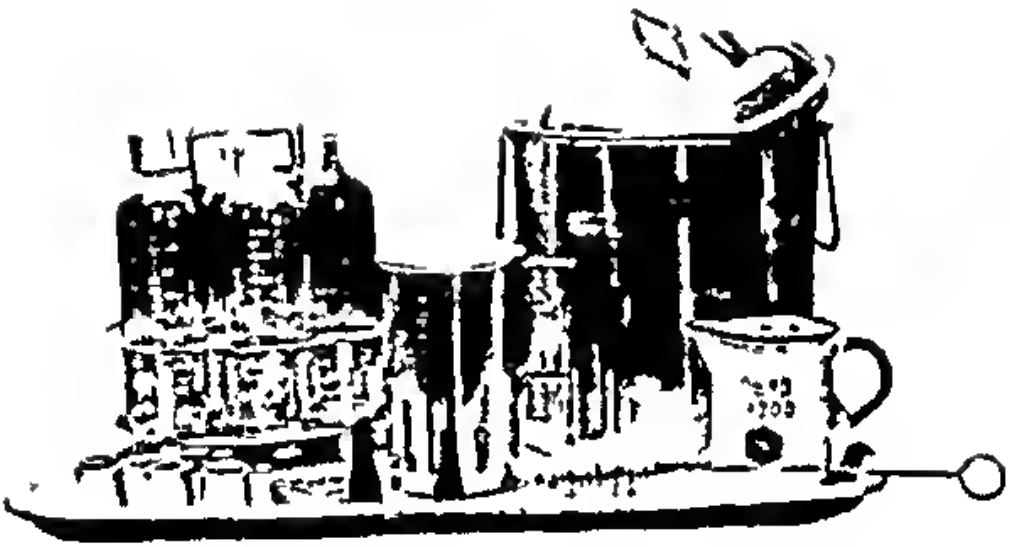

FIG. 7.—Complete Soxhlet apparatus

[To face p. 91.

it is completely dissolved. The importance of this lies in the prevention of small clots, which tend to plug the hole in the teat. Boiling water should not be poured on the dried powder or clots will result. In pouring the milk from the jug to the bottle it is often an advantage to strain through clean butter muslin. This procedure, however, is usually not necessary. The food must be given *warm*, and there is a tendency rather to overheat the bottle before giving it. The optimum temperature is that of the infant, and, without experience, the temperature is seldom guessed with accuracy when the bottle is felt to see if it is warm enough. A thermometer should be used at first to see that the temperature of food approximates to 100° F.

Preparing Fresh Cow's Milk Feeds. Occasionally each feed is made up separately, but on the whole the better method is to make up the feeds for the whole day. When possible a soxhlet apparatus should be obtained (see Fig. 7). The requisite amounts of cow's milk, water and sugar are mixed together in a jug, and the five or six clean soxhlet bottles are filled equally with the mixture. These bottles are then firmly stoppered, and placed in the cruet, and the whole lowered in the container, where they are heated until the milk in the bottles just begins to bubble. The bottles are then put in a cool place and used in turn, as each feed becomes due. A bottle is heated by standing in a jug of warm water. The teat is placed on it, and the mixture fed directly to the infant from this bottle.

A simple form of soxhlet apparatus can be improvised by taking five or six 8-oz. medicine bottles, properly sterilised, and pouring an equal amount of the milk mixture into each—closing each one with a plug of cotton wool. The bottles are then placed in a saucepan of water and heated until the milk just begins to bubble, and then put in a cool place. Each bottle is warmed up when wanted.

When the feeds are made separately it is probably best to sterilise the milk by just bringing to the boil when it first arrives. If carefully kept in a cool place, it

need not be further sterilised. Where facilities for the care of the milk are not good, it is safer to sterilise each individual feed by bringing to the boil

Amount of Feed and Formulæ

At intervals during the first twenty-four hours after birth the infant should be given sips of warm water During the second day 1 oz. feeds of sugar water (one teaspoonful of sugar to 4 oz. of water) should be given at regular intervals from a bottle. In this way the infant is taught to suck properly

From the second to the fourth day full amounts of feed are offered, but they are made up one half of the strength given in the following formulæ. Commencing on the fifth day, full strength feeds are given.

From the Fourth Day to One Month

(I.) Humanised Dried Milk Formulæ for a Normal Healthy Infant from the Fourth Day to One Month

Weight of Infant in Pounds	Measures or Drachms of Humanised Dried Milk.[1]		Water in Ounces		Number of Feeds Daily
	Per Day	Per Feed	Per Day	Per Feed	
5	12½	2	12½	2	6
6	15	2½	15	2½	6
7	17½	2¾	17½	2¾	6
8	20	3½	20	3½	6
9	22½	3¾	22½	3¾	6
10	25	5	25	5	5
11	27½	5½	27½	5½	5
12	30	6	30	6	5

Note. Where no measure is obtainable, a "very heaped" teaspoon is approximately a drachm

(II). Fresh Cow's Milk Formula for a Normal Healthy Infant from the Fourth Day to One Month

Boiled cow's milk . . ½ pint = 15 oz
Water . . . . ½ pint = 15 oz.
Brown Demerara sugar . 3 level tablespoonfuls

[1] Humanised Ambrosia, Allenbury's No 1, Humanised Cow and Gate, Sunshine Glaxo Oster milk No. 1, Humanised Trufood, etc

Of this mixture give oz.
at 6 a.m., 9 a.m., 12 noon, 3 p.m., 6 p.m. and 10 p.m.
or 6 a.m., 10 a.m., 2 p.m., 6 p.m. and 10 p.m.

When baby weighs	5 lb	give	6 feeds of	2½ oz	of the above
,,	6	,,	6	,,	2½	,,
,,	7	,,	6	,,	3	,,
,,	8	,,	6	,,	3½	,,
,,	9	,,	6	,,	3½	,,
,,	10	,,	5	,,	5	,,
,,	11	,,	5	,,	5½	,,
,,	12	,,	5	,,	6	,,
,,	13	,,	5	,,	6½	,,
,,	14	,,	5	,,	7	,,
,,	15	,,	5	,,	7	,,

Quick Feeding

See that the hole in the teat is a good size, so that the baby can get the feed in ten minutes easily.

Breaking Wind

Hold baby up for twenty minutes after each feed, until the wind is broken twice

Fruit Juice

Give orange or tomato juice, two to three teaspoonfuls daily throughout the year, diluted with water and sweetened with sugar.

To Prevent Rickets

A drop of halibut liver oil, or some cod liver oil preparation, or one of the concentrated vitamin D preparations, such as Ostelin or Radiostoleum, are required before three feeds, except in the hottest summer weather

(III.) Unsweetened Condensed[1] (Evaporated) Milk Formula for a Normal Healthy Infant from the Fourth Day to One Month.

Condensed milk . . .	5 oz
Water	15 oz
Brown sugar . . .	2 level tablespoonfuls

Directions Of this formula give the infant the same quantities as shown in the table for fresh cow's milk above The same directions for quick feeding, breaking wind, fruit juice and prevention of rickets also apply

From One Month to Six Months

Dried Milk. It is the author's experience that after the first month the infant thrives better on a full-cream dried milk rather than on a humanised dried milk

[1] Ideal, Libbys and Carnation Brand

(I) Formulæ for Feeding on Full-cream Dried Milk from One to Six Months [1]

Weight of Infant in Pounds	Full-cream Dried Milk in Drachms or Measures		Water in Ounces		Level Teaspoonfuls of Sugar		Number of Feeds
	Per Day	Per Feed	Per Day	Per Feed	Per Day	Per Feed	
5	8	1½	12½	2	5	½	6
6	9½	1½	15	2½	6	1	6
7	11	1¾	17½	3	7	1½	6
8	14	2½	20	3½	8	1½	6
9	15½	2¾	22½	3¾	9	1½	6
10	17	3½	25	5	10	2	5
11	18½	3¾	27½	5½	11	2½	5
12	21	4	30	6	12	2¾	5
13	22½	4½	32½	6½	13	2¾	5
14	23	4¾	35	6¾	14	2½	5
15	25	5	37½	7	15	3	5

Note When the infant reaches the weight of 15 lb., or the age of six months, the next diet sheet should be commenced (see No 3)

(II) Fresh Cow's Milk It will be noticed that the formula given below is considerably stronger than the one which was used during the first month The authors think it is never desirable to change the strength of the formulæ too quickly The competent and intelligent maternity nurse will make the change gradually from one formula to the other during the fourth week

Formula for Normal Baby from One to Six Months

Boiled cow's milk	1 pint = 20 oz.
Water	½ pint = 10 oz
Brown Demerara sugar	3 level tablespoonfuls

Of this mixture give oz

at 6 a.m., 9 a.m 12 noon 3 p.m., 6 p.m and 10 p.m
or 6 a.m., 10 a.m., 2 p.m., 6 p.m and 10 p.m

When baby weighs 5 lb give 6 feeds of 2½ oz of the above

"	6	"	6	"	2½ "
"	7	"	6	"	3 "
"	8	"	6	"	3½ "
"	9	"	6	"	3½ "

[1] Cow and Gate Glaxo Dorsella, Lacta Milkal Ambrosia etc

When baby weighs 10 lb give 5 feeds of 5 oz. of the above

,,	11	,,	5	,,	5½	,,
,,	12	,,	5	,,	6	,,
,,	13	,,	5	,,	6½	,,
,,	14	,,	5	,,	7	,,
,,	15	,,	6	,,	7	,,

Quick Feeding.

See that the hole in the teat is a good size, so that the baby can get the feed in ten minutes easily

Breaking Wind

Hold baby up for twenty minutes after each feed until the wind is broken twice

Fruit Juice

Give orange or tomato juice, two to three teaspoonfuls daily, diluted with water and sweetened with sugar

To Prevent Rickets

A drop of halibut liver oil, or some cod liver oil preparation, or one of the concentrated vitamin D preparations, such as Ostelin or Radiostoleum, are required before three feeds, except in the hottest summer weather.

(III.) Unsweetened Condensed[1] (Evaporated) Milk Formula for a Normal Healthy Infant from One Month to Six Months

Condensed milk .	10 oz
Water . . .	20 oz
Brown sugar . . .	3 level tablespoonfuls

Directions Of this formula give the infant the same quantities as shown in the table for fresh cow's milk above The same directions for quick feeding, breaking wind, fruit juice and prevention of rickets also apply

Measures. Since directions are given in teaspoons and tablespoons, and since there is no universally accepted standard teaspoon and tablespoon, this causes confusion It is always best to measure fluids in ounces, as very often an ordinary household tablespoon contains from ½ to 1 fluid oz Glass measures or measuring jugs marked in ounces on the inside, or even a child's feeding bottle marked in ounces will be found much more accurate In measuring solids, teaspoons vary enormously. Actually a level measure (slightly pressed down) of skimmed, half-

[1] Ideal, Libby's and Carnation Brands

cream, or full-cream dried milk weighs 1 drachm or ⅛ oz. A very heaped teaspoon of skimmed, half-cream, or full-cream dried milk also weighs 1 drachm (if measured in a teaspoon purchased from Woolworth's). A level teaspoon, slightly pressed down, is ½ drachm. A level tablespoon (Woolworth's size), slightly pressed down, of any of the above is equal to 2 drachms (¼ oz.).

Sugar. This will be found to be much heavier than dried milk. One level teaspoon equals 1 drachm. One level tablespoonful equals 4 drachms. A lump of Tate and Lyle's sugar weighs on the average 1 drachm. The tin measure given in Cow and Gate dried milk, if levelled off and slightly pressed down with brown sugar, weighs 2 drachms.

It should be noted that an English pint is 20 oz. and an American pint 16 oz. An English tablespoonful is exactly twice the size of an American tablespoonful.

CHAPTER VI

MIXED FEEDING FOR NORMAL HEALTHY CHILDREN

COMMENCEMENT OF MIXED FEEDING

When the child reaches 15 lb. in weight, he requires about 25 oz. of cow's milk. We do not believe that any infant or child requires more than this quantity of cow's milk at any age. It seems logical then to start adding other foodstuffs of a more solid nature. To balance the child's diet, he requires more carbohydrate, and this is best given as starch.

Bone and vegetable broth can be added to the diet with benefit as early as three months, and since the cow's milk as well as breast milk tends to be deficient in iron, we consider that early mixed feeding is warranted, if for no other reason than this.

Cereal Feeding.[1] When should starch be added to the diet?

To answer this question it is well to understand the uses of starch in infant feeding.

1. Starch forms a colloidal solution with milk—that is, it mixes so thoroughly with the molecules or particles of casein that these seem incapable of running together and forming large clots or curds. Put another way, the curds formed in the stomach after a feed of cow's milk and barley water are smaller than the curds of cow's milk diluted with water only (see p. 61).

2 It is necessary in artificial feeding to keep the carbohydrate side of the diet at such a level that the fat is completely burnt up or metabolised by it, and starch is of assistance in attaining this. It may be necessary to add to a feed two heaped teaspoonfuls of sugar in order to

[1] Paterson, Donald: "The Uses of Starch in Infant Feeding," *Practitioner*, June, 1930

"balance" a feed, and on such an amount of sugar the child *may develop a fermentative diarrhœa* On one heaped teaspoonful of sugar and one of groats, Benger's or other starchy food, the *same object is achieved, but the* fermentative diarrhœa does not occur

Despite some evidence to the contrary, from a practical standpoint it has been found that infants digest and thrive well on well cooked or split starch granules, if given in small amounts only, from the second month onward It is perhaps better practice, however, as a routine measure to start adding starch seriously to the diet after the child reaches the age of five or six months It is well at this time to add some form of starch to one feed only in the day—say, the 10 a m feed, then the 2 p m feed and finally the 6 p m feed The form of starch for breakfast or the 10 a m feed should be wheat, oat, or barley *flour*—one heaped teaspoonful making about half a teacupful of the cooked product At 2 p m the starch is offered to the infant in the form found in bone and vegetable broth—namely, potato, carrot, parsnips or greens (see p 157) At 6 p m one of the cereals mentioned at 10 a m should be given, but not the same cereal

Starch must be added to the diet at all times with great care With too small amounts the child fails to gain in weight or thrive This is frequently seen in the child fed exclusively on cow's milk, when the weight has reached 15 lb On the other hand if overdone, as is often seen in the *children of the poor, the child tends to become* soft flabby and pale, lacks energy and tends to become rachitic Only one feed of any one form of starch should be given in the day, for the greater the variety of starches fed the more success is likely to be achieved There is no objection whatever to the use of one of the well known proprietary foods (see p 53) provided such is added to the milk feed with the full knowledge that it is merely a substitute for the groats or other starchy food With the introduction of starch into the diet, one of the possible causes of flatulence has been introduced See also Cereal Feeding (p 87)

Diet for a Normal Healthy Infant from Six to Nine Months Old (Weight 15 to 18 lb)

Feeding Times 6 a.m., 10 a.m., 2 p.m., 6 p.m., 10 p.m

6 a.m

Milk	6 oz
Water	2 ,,
Sugar	1 heaped teaspoonful

10 a.m

Mixture as above to which has been added one to three heaped teaspoonfuls of either Chapmen's entire Wheat Food, Sister Laura's Food, Groult's Cream of Rice, Robinson's Patent Groats or Patent Barley or Farex (See below re cooking) Half a teaspoonful of the yolk of a lightly boiled egg should be slowly introduced along with this feed, and gradually increased to two teaspoonfuls if well tolerated.

2 p.m

Milk	5 oz
Sugar	1 heaped teaspoonful

Add to this two tablespoonfuls of bone and vegetable broth (see below) One or two tablespoonfuls of Heinz, Libby's or Nestlé's homogenised vegetable can be added to this meal with advantage

6 p.m

Exactly as at 10 a.m., but add one to three heaped teaspoonfuls of a *different cereal from the one given at that feed.*

10 p.m

Exactly as at 6 a.m

Fruit Juice

Orange or tomato juice, two to three teaspoonfuls diluted with water and sweetened with sugar, should be given daily A convenient time for this is between 8 and 10 a.m., or at teatime

To prevent rickets an egg*spoonful of cod liver oil or one drop of halibut* liver oil should be given immediately before three of the feeds throughout the year, except in the hot summer weather

Note re Cooking

All milk should be brought to the boil In making up the cereal for the 10 a.m. and 6 p.m. feeds such as Groats, Cream of Rice, etc., this needs to be cooked directly for at least twenty minutes or from half an hour to an *hour in a double saucepan It may be added to the rest of* the feed and the whole cooked for the specified time, or it may be cooked with water and then stirred into the rest of the feed when it is thoroughly cooked.

N B Owing to the thick nature of this feed it is necessary to make a large hole in the teat if given from a bottle If possible, it is more desirable to spoon feed from a cup, as a semi-solid

Method of making Bone and Vegetable Broth.

Take 1 lb of veal bones or beef bones well broken up Cover with water and add one teaspoonful of vinegar Occasionally say once a fortnight add a piece of calves' or ox liver (about 2 oz) Simmer for from one to four hours Now add vegetables (carrots, cauliflower, green vegetables and one potato) Simmer for one more hour strain, and allow to set Give one to two tablespoonfuls in the 2 p.m. feed (as directed) (The broth is best cooked in a double saucepan, and should keep for three days if kept in a cool place)

Diet for a Normal Healthy Child from Nine Months to One Year Old (Weight 18 to 22 lb)

Note

The transition from the previous diet to this one should be slow, taking say, a fortnight

On Waking

One tablespoonful of orange juice, tomato juice or grapefruit juice diluted with water and sweetened with sugar One rusk.

8 a m.

1 Half a cup of cereal (such as Chapman s Entire Wheat Food Cream of Wheat Wheatena Groats, Farex etc) fed with a spoon from a cup or a rusk and milk, or half a Robb s biscuit with milk

Four mornings in the week give half an egg and two mornings toast crumbs or crisp toast fried in bacon fat or chicken dripping

2 Eight ounces of milk (including that given with the cereal)

12 30 p m.

1 One to two tablespoonfuls of mashed potato and one to two tablespoonfuls of steamed vegetables, moistened with four tablespoonfuls of broth (see below) As the child approaches one year of age the following may be added Pounded chicken sole plaice brains or underdone scraped steak The Heinz, Libby s or Nestlé s homogenised vegetables will be found suitable at this meal.

2 One to two tablespoonfuls of Cream of Rice or tapioca or sago or semolina (Gmuit s or Bacon Robinson) with sugar, or jelly or apple sauce

3 Four ounces of milk at this meal (which should be used for making up the pudding)

4 Water to drink.

4 30 to 5 p m.

1 Rusk and milk or Robb s biscuit and milk or preferably rusk spread with butter or thin brown or white bread and butter

2 Junket or stewed fruit or custard.

3 Eight ounces of milk.

10 p m

Four ounces of milk if necessary, but the child should not be wakened for it. Normally the 10 p m bottle should be discontinued between nine and ten months of age

To prevent rickets and ensure good teeth half a teaspoonful of cod liver oil, or cod liver oil and malt, or one drop of halibut liver oil, should be given three times daily throughout the year except in the warm summer weather

It is well to try as the child approaches the ninth month to give only three substantial meals in the day—breakfast, dinner and tea. The 2 p.m. feed is moved back to 12 30, and at the same time the 10 a m. feed is given earlier and earlier, and finally becomes the eight o'clock breakfast. The 6 a.m. feed is made smaller in amount and eventually drops altogether, being replaced by orange or tomato juice and possibly a half rusk. The 6 p.m. feed is given at 5 p m , and for a time it will be found necessary to give a plain bottle of cow's milk, water and sugar at 10 p m.

On p. 99 will be found suggestions for feeding at the age of nine months to one year with weight of from 18 to 22 lb.

When should the Night Bottle be Discontinued? This will vary with each individual child. Many are able to go without it as early as the sixth month; other infants cannot sleep from 6 p m. till 6 a.m. without one night feed before the age of one year. It will be found that on the average the night bottle may cease at nine or ten months, but, in this particular, each individual child must be studied. Certainly after the first birthday is passed, no child should be wakened for the night bottle, and four feeds only should be given as soon as possible, provided the child is able to take enough food for its proper nutrition.

Feeding from One to Seven Years. For the proper understanding of the feeding of children three things are necessary:—

1. To ascertain that the child is having the proper food at regular intervals, not too frequently and in the proper amount.

2. That the child's general management as to its sleeping, eating, exercise and fresh-air habits are such as to provoke a healthy appetite.

3. That the person who actually offers the child food does so in a manner conducive to its being taken, *i.e.*, without undue urging, coaxing, bribing or harassing the child.

It should be made a golden rule that the less frequently a child is offered food, the less likely it is to be overfed Much more illness is seen in children from the age of *one to five years due to overfeeding* than results from underfeeding, and this is generally because meals are given at too frequent intervals It has to be remembered that at two and a half years, when the first dentition is complete, the child has as many teeth and is as well able to chew and masticate its food as it is at the age of five or six, and therefore the composition of the food at this period is the same, the amount only of each food being varied

It is essential that the diet should contain fresh foods in order to supply the necessary vitamins Oranges or tomatoes supply the anti scorbutic, whilst cod or halibut-liver oil supplies the anti rachitic vitamins during the winter months

As a rule the tendency among both rich and poor is to *overfeed* children between the ages under consideration on starches giving them too little animal fat and protein Such starchy foods as porridge, toast, bread potatoes and milk pudding are given in excess, and animal proteins, because of their cost and the fact that they need cooking and that they perish easily, and to some extent because of the fallacious idea that the growing child does not need ment, are given in far too small quantities On pp 103 and 104 are shown suitable diets for children of from one to two years and from two to seven years respectively

A complete diet should contain sufficient

(*a*) CALORIES A child aged three years should weigh *31 to 35 lb* and needs 45 to 50 calories per pound body weight per day (see Appendix (p 168) for details of the various ages)

(*b*) FOOD ELEMENTS

1 *Protein* 1 8 gm of protein am required per pound body weight per day (Holt) [1]

[1] Holt L. E and Fales, H L Protein Requirement of Children' *Am. Journ Dis Child.* Vol XXII., p 371

2 *Fat* 1 3 gm of fat are required per pound body weight per day (Holt) [1]

3 *Carbohydrate* 5 gm of carbohydrate are required por pound body weight per day (Holt) [2]

(c) Essential Salts

1 *Phosphorus* The needs of a normal child are 1 2 gm daily (Sherman) [3]

2 *Iron* The needs of a normal child are 6 to 12 mg daily (Sherman) [3]

3 *Calcium* The needs of a normal child are 1 gm daily (Sherman) [3]

(*d*) Water and other Salts, *e g*, sodium, potassium magnesium, oto

(*e*) Vitamins

Vitamins A, B, C and D (see p 39)

A week's menu, calculated on such a basis, will be found in the Appendix, on p 164

How Much Milk should the Child have at this Age? There is no doubt that milk should be a staple article of the diet of the growing child at this age Nevertheless, next to starches there is nothing which tends to be over done so much as cow's milk The common fault is to give the child from 30 to 40 oz of cow s milk in the day and then be surprised that solid food is not taken Loose stools almost invariably result One pint of milk should be sufficient between the ages of one and seven years It has been shown that a minimum of one half pint of milk is required per day to provide the growing child's bones and teeth with the necessary supply of lime

[1] Holt L E and Fales H L : 'Fat Requirement, *Am Journ Dis Child* Vol XXIII p 471

[2] Holt L E and Fales H L : Carbohydrate Requirement' *Am Journ Dis Child* Vol XXIV p 44

[3] Henry C Sherman The Chemistry of Food and Nutrition,' (Macmillan New York) 3rd ed , 1923, pp 303, 316 and 338.

Diet for a Normal Healthy Child of from One to Two Years

On Waking

1 The juice of half an orange or a dessertspoonful of tomato juice, diluted with water and sweetened with sugar
2 One small rusk

Breakfast 8 a m

1 One to two tablespoonfuls of any of the following Well-cooked groats, cream of wheat, or Wheatena, or rusks in milk, or Robb's biscuits in milk In warm weather stewed fruit and crisp toast may be given in place of the above (See that the child's appetite is not satisfied with this course)
2 Toast crumbs fried in bacon fat or a small rasher of crisp bacon or half a soft boiled egg with breadcrumbs (four days in the week) or pounded plaice or sole or fresh herring
3 Eight ounces of milk (including that used with the cereal)

Dinner 12 30 p m

1 One level tablespoonful of any of the following Fish, boiled or steamed or pounded chicken or brains or sweetbreads or scraped raw or underdone steak or Irish stew or lightly cooked liver
2 One to two heaped tablespoonfuls of boiled baked, or mashed potato Stewed sprouts cabbage spinach or greens cauliflower, carrot or parsnip or lettuce (These are all best steamed)
3 Milk pudding (Groult's cream of rice tapioca etc) with stewed apples prunes junket or custard Water to drink.

Tea-supper, 4 30 to 5 p m

1 Rusks or pulled bread (Zwieback) or crisp toast or thin bread and butter with a little honey seedless jam jelly, custard, junket or stewed fruit and a small piece of sponge cake
2 Once per week half an over ripe banana may be given if well tolerated (Between one year and eighteen months Robb's biscuits or rusks may be given *soaked in warm milk*)
3 Eight ounces of milk (including any used with biscuits)

6 15 p m

It ought not to be necessary to give anything after tea-supper If the child eats a poor tea however some of the milk and rusks may be kept and offered before he is put to bed but this should not be done as a routine

Milk

One pint of milk a day should be sufficient, including that used in cooking

Sweets

Plain boiled sweets such as barley sugar (Barley Malts or Barley Brights) or fruit drops or Mackintosh's toffee, may be offered after dinner and tea (The teeth should be cleaned immediately after this)

Note

Some of the solid constituents in this diet must be introduced slowly during the period from one to two years the whole diet not being suitable to commence with Red meat should be introduced slowly and in very small quantities at first

To prevent rickets and ensure good teeth a teaspoonful of cod liver oil or cold liver oil and malt or halibut liver oil one drop should be given three times daily throughout the year, except in warm summer weather

Diet for a Normal Healthy Child of from Two to Seven Years

On Waking

The juice of an orange or grapefruit, or the juice of a tomato, *diluted with water and sweetened with two lumps of sugar*, or two teaspoonfuls of glucose

Breakfast 8 *a m*

1 Porridge, cornflakes Grapenuts, Shredded Wheat, Cream of Wheat, Wheatena, Digestive biscuits, or some dried cereal or in place of this, in warm weather, stewed apples, prunes, or figs (Do not satisfy the child's appetite with this course)
2 An egg (three mornings per week), or
3 Tomatoes and rashers of crisply fried bacon (three mornings per week) or
4 Fish or lightly cooked liver (one morning)
5 Crisp toast or rusk spread with butter
6 Eight ounces of milk (including that given with cereal)

Dinner, 12 30 *p m*

1 One to two level tablespoonfuls of any of the following Cutlet mince or stew, liver, underdone beef or steak finely cut up, or brains fish, chicken or sweetbreads (Red meat four days in the week, white meat three days)
2 One to two heaped tablespoonfuls of boiled, mashed or baked potato
3 One to two heaped tablespoonfuls of mashed carrots, cauliflower, sprouts peas, beans spinach or greens
4 Milk pudding or stewed fruit, or steamed pudding (not suet) or custard—one heaped tablespoonful Water to drink.

Tea-supper, 4 30 *to* 5 *p m*

1 Crisply toasted wholemeal or brown bread, pulled bread (Zwieback) thin bread and butter, rusks and butter, or cream cheese sandwiches
2. Mashed over ripe banana or stewed fruit, seedless jam, jelly or honey
3 A small piece of sponge cake
4 Eight ounces of milk

6 30 *p m*

If the child has left some of his tea, the remnants may be offered at 6 30, but as a rule it will be found best not to give anything before going to bed

Milk

One pint of milk should be sufficient including that used in cooking Some children prefer milk flavoured with cocoa or tea

Fruit

The child will not lack vitamin C if fruit juice is given on waking It is desirable, however, if well tolerated, that one of the following should be given daily *apple orange pear, peach* or *nectarine, or* banana Unless fruit is thoroughly ripe however, it is best given cooked.

Sweets

Plain boiled sweets, such as barley sugar (Barley Malts or Barley Brights) or fruit drops or Mackintosh's toffee, may be offered *after* dinner or tea (The teeth to be cleaned immediately after this)

To prevent rickets and ensure good teeth a teaspoonful of cod liver oil or cod or halibut-liver oil and malt or a few drops of halibut-liver oil should be given three times daily throughout the year, except in warm summer weather

Diet for School Age

Fruit

Either on waking or to commence breakfast fresh fruit is most advisable A ripe apple orange juice a few grapes, or half a grape fruit should be given.

Breakfast

1 *Porridge Grapenuts Shredded Wheat Force Puffed Rice* Wheatena Cream of Wheat Groats Creamed Barley etc (A small helping should be given so that the child's appetite is not satisfied)
2 An egg (soft boiled scrambled or fried) with or without bacon, three mornings in the week. On the other mornings crisply done thin rashers of bacon with tomatoes or fish (sole plaice fresh herring or kipper) Cold lean sausages or liver occasionally Brown mashed potatoes occasionally with the main dish.
3 Crisp toast butter and marmalade
4 A glass of milk or weak tea and milk.

Dinner

1 Cutlet fresh mince or stew a cut of roast beef steak, mutton (four days in the week) and chicken fish sweetbreads liver or kidney on three days For older children rabbit occasionally
2 Boiled baked, or mashed potato with carrots cauliflower parsnips or green vegetables such as spinach sprouts or cabbage or peas or beans
3 Stewed fruit and milk pudding or custard, or sponge or steamed puddings Water to drink.

Tea supper

(See note below for directions when tea and supper are given separately)

1 Thin bread and butter with fruit such as baked apple or stewed prunes or mashed over ripe banana, or Sun maid raisins or milk pudding or honey jam or jelly or cream cheese sandwiches.
2 Sponge cakes Milk or weak tea or cocoa with milk

Note

As the child approaches the age of seven or eight, a more substantial tea supper is required. Occasionally an egg may be introduced or vegetable broth, or fish, or macaroni or spaghetti, or kedgeree or beans and tomatoes fried with breadcrumbs or cheese, or a milk pudding may be added to the meal At the age of about nine or ten however it is best to give a very light tea at 4 30 and supper should be instituted at 6 to 6 30

Suitable Suppers are

Kidneys on toast, with rice pudding Ham with salad and blanc mange Fish and potato with baked apple Sausage and potato with fruit or jam trifle Baked eggs done with tomatoes and milk jelly or orange soufflé Macaroni and cheese and Caramel pudding Tomato or potato soup and coffee blanc mange Semolina on toast with stewed pears and custard Sweetbreads with stewed apples and cream Minced chicken on toast with white sauce and junket.

Milk

Owing to the large number of children who cannot tolerate much milk a good average per child is 1 pint per day In exceptional cases where it is well tolerated more may be given with advantage, but it should not in any circumstances be pressed

Sweets

Plain boiled sweets, such as barley sugar (Barley Malta or Barley Brights) or Fruit Drops or Mackintosh's toffee should be offered after dinner or tea (the teeth to be cleaned immediately afterwards).

Diet for Children of School Age The growing child requires a substantial and mixed diet It should contain fresh meat an abundance of fresh vegetables and fruit, butter, milk and occasionally eggs, and it should be properly balanced with sugar and starch The child requires much more food relative to its size than does the adult The authors would draw attention of school masters and others to the old adage, " *You cannot fatten 4-stone without a supper* " We feel strongly that a properly *cooked* hot supper is necessary from 8 years onwards, i e , throughout the whole " school " age

CHAPTER VII

DIARRHŒA, VOMITING AND CONSTIPATION (INCLUDING INDIGESTION)

Acute dyspepsia or gastritis in infants is always accompanied by diarrhœa, or at least undigested motions.

Among the commonest symptoms which the practitioner is called upon to deal with in infants are diarrhœa and vomiting. It is of the utmost importance that the doctor should have a clear knowledge of their commoner causes, as they may either be manifestations of some serious illness or merely of some transient disturbance, often caused by unsuitable feeding.

Diarrhœa

This symptom as it occurs in the breast-fed infant has already been discussed on p. 30.

Frequent stools may result from—

1. An infection of the bowel by some pathogenic organism.

2. Acute dyspepsia or indigestion due to overfeeding or to some food indiscretion, and not primarily organismal in origin.

3. Some infection outside the gastro-intestinal tract. This diarrhœa may be termed symptomatic, and is seen in infants with diseases as, *e.g.*, middle-ear disease, cerebro-spinal meningitis, bronchitis, or more commonly from naso-pharyngitis and colds.

Cases from group 1 occasionally, but more commonly from group 2, when the diarrhœa occurs in the warmer months, are known by the term "*summer diarrhœa.*"

1. Infective Diarrhœa. These are severe infections set up by organisms such as the streptococcus, Flexner, Shiga, Sonne, or Y dysentery, or one of the typhoid group. Food poisoning may also give rise to a similar clinical picture. The onset is acute, with marked toxæmia, and

a high fever. Blood and mucus in the stools are the rule. Treatment should be directed against the specific organism. Dietetic measures are discussed later.

2. Dietetic Diarrhœa. In the second group, due to *food indiscretions*, we have a proportion of these cases of diarrhœa commonly met with in general practice. Probably the most frequent is the diarrhœa seen in the overfed infant, especially when his tolerance for fats is overstepped. This is most likely to occur in warm weather. In the older child the trouble is often called a "bilious attack."

In the young infant the attack is preceded by certain symptoms. There is failure to gain in weight, a slight temperature, a dirty tongue, lethargy alternating with restlessness, and pale-coloured motions are present. At the onset, an *excess of fat* may cause pale, constipated crumbly motions; later, as the tolerance for fat decreases, the motions are pale, loose and, finally, acid, green, and contain curds. On the other hand, *excess of carbohydrate* may be the element in the faulty diet which gives rise to diarrhœa. When this is the case there is a tendency on the part of the infant to refuse some of the feed, and, if he be urged, this excess of sugar is not completely absorbed, and in the intestine fatty acids are formed first which irritate the mucous membrane of the bowel, causing increased peristalsis with green, frothy motions (fermentative diarrhœa). The buttocks in both fat and carbohydrate excess diarrhœa are severely excoriated. The temperature, if raised, is rarely above 100° F.

In some of the older infants fed on the starchy proprietary foods, it may be the starch itself which is giving rise to the diarrhœa. It cannot be too strongly emphasised that even on a well-balanced diet, such as the ideal food, breast milk, an excess in itself will produce frequent undigested motions, and no one element can be blamed more than the other; thus the diagnosis of the offending portion of the diet may be extremely difficult, and it may be an excess of all rather than of any one element.

glucose water or weak tea may be given alternately by the mouth for twenty four or forty-eight hours (see Appendix) This should be followed by skimmed lactic acid milk (see p 76) or Lacidac (Cow and Gate Ltd) Other feeds suitable are dried buttermilk made by Nestlé, "Lledon" or Glaxo (see p 79) Supposing lactic acid milk is decided upon, then equal parts with water, adding a small amount of sugar, should be used to commence with Gradually the strength of the mixture should be increased until the child is getting two parts of lactic acid milk to one of water It will also be found useful to thicken such feeds with a little starchy food such as Savory and Moore's or Benger s Food at this stage

A good plan of campaign is as follows —

For two days alternate drinks hourly of half strength normal saline and glucose water On the third day offer lactic acid milk and water (equal parts) and sugar every four hours Make sure that the feed is not urged Continue to offer alternate drinks of half-strength normal saline and glucose water hourly between feeds day and night The infant will gradually wean itself off the bland drinks, taking only the food and such a result as that given below will probably follow if the infant is allowed to regulate its own food intake

	Lactic acid milk mixture taken.	Sugar water and half strength normal saline taken
1st day	Not offered	40 oz
2nd „	Not offered	30 „
3rd „	2 oz	30 „
4th „	6 „	25 „
5th „	10 „	20 „
6th „	18 „	14 „
7th „	25 „	10 „
8th „	30 „	2 „

Diarrhœa in Older Children When this is due to dietetic indiscretion or to one of the less severe infections, a preliminary dose of castor oil should be followed by a day of starvation Sugar water, orange juice, lemon or

barley water should be given freely, with a gradual return to the normal diet A preliminary step should be the use of a lower fat, or half cream dried milk (see p 49)

A recently introduced method of treatment of diarrhœa in older infants and children is known as the "apple treatment" [1] This depends on the presence of malic acid derivatives normally found in the apple A simple method of preparation consists of finely grating or sieving a fresh ripe apple From a teaspoonful to several tablespoonfuls should be given at each feed depending on the age of the child and fed from a bottle or spoon. Additional drinks of weak tea, bringing the total of fluid up to 2½ oz per pound body weight per day, are given between apple feeds The whole treatment lasts three to four days

"Aplona" a dried apple preparation manufactured in the Children's Hospital, Munich, and sold in London by Coates & Cooper Ltd, 94 Clerkenwell Road, E C 1, can be obtained. The authors see no reason why dried apple rings, obtainable at any grocers, should not be an efficient substitute

The Prevention of Diarrhœa *The mortality among infants from diarrhœa especially in the summer months, still remains high Much of this mortality could be prevented if some of the factors in its causation were more understood by those who are responsible for the care of the child*

The child is prescribed a feed suitable for the cooler months of the year and as time goes on this feed is automatically increased, often without regard to the fact that the weather is getting warmer and that fewer calories are required owing to diminution of heat loss from the infant's body The correct feeding in May or June becomes entirely too much in the hot weather of July or August. The average adult eats less during extremely warm weather, and, because of a greater loss of fluid by perspira-

[1] Sheldon, W. and Hall, M "The Apple Treatment of Infantile Diarrhœa," *Arch Dis Ch*, Vol XIV, p 43, March, 1939

tion, he *drinks increased quantities* of water. The diet of an infant is not under its own control, and it is unable to ask for a drink of water. It is offered its feed, and if it leaves some the mother becomes anxious. A little later the child is again offered food and to quench its thirst, for it too is losing fluid by perspiration, it takes the remainder of its feed and so adds tremendously to the work of its digestive system. After a short time the *overfed* infant vomits, so getting rid of the excess of food beyond its requirements. At the same time there may be several loose undigested stools. If at this stage the diet was reduced and more water offered the child, the trouble would probably be averted. Unfortunately, this is too often not recognised, the child is again overfed and the symptoms become more marked. Frequent loss of fluid by vomiting and diarrhœa result in acute dehydration, and the picture of summer diarrhœa with its intoxication is produced.

It is not suggested that overfeeding alone is the only cause of summer diarrhœa, but it is certainly one of the important factors. The prevention of this disease consists in *reducing the feed* during the warmest period of the year and prevention of dehydration by giving the child frequent drinks of water during the hot season. The infant must not be over-urged to take its feed, and such feeds should not contain a high fat mixture. Top milk or added cream mixtures must be watched carefully in warm weather, so also must the full-cream dried milk mixtures. *Over-clothing must be avoided*, as it tends to make the child perspire continuously and produce dehydration. He should be kept as cool as possible.

The milk should be carefully guarded against souring either by lactic acid organisms or by more pathogenic bacteria. The question is sometimes asked: "Is it better to boil the milk as soon as it is brought into the house or is it better to boil immediately before giving to the infant?"

There is little doubt that the ideal method is to sterilise the whole day's feeds in separate bottles at one time. For the Soxhlet apparatus, see p. 91. Where

such measures cannot be adopted, a dried or condensed milk is to be recommended. *Extreme cleanliness* on the part of the nurse or other attendants of the child is essential. The exclusion of flies from the nursery, and care in the keeping of the food, must play an important part in the prevention of diarrhœa.

The prevention of that great group of diarrhœas in infants, secondary to sore throats, colds, ears and naso-pharyngeal catarrhs, must rest on the isolation of the infant from infections carried into the nursery. No group is more preventable. The wearing of a mask by the mother or nurse, at the slightest suggestion of a cold, is strongly urged.

Rectal Temperature. In small infants, the frequent taking of the temperature rectally may either provoke diarrhœa, by acting as a stimulus to the anus, thus causing evacuation of the bowel, or prolong a diarrhœa already established. In the authors' opinion, the practice of taking the temperature rectally is one which might well be given up in favour of taking it in the groin or axilla—the thermometer being left in position for five minutes. Alternatively, the temperature should not be taken more than twice daily if taken rectally, a degree being subtracted from the figure thus obtained, to bring it to the correct one.

Vomiting

Nearly every infant is inclined to posset or spit up a few teaspoonfuls of its feed, usually immediately after the feed is finished. This may be due to a slight overfilling of the stomach or may occur during the eructation of wind.

Vomiting may be divided into—

1. **Obstructive vomiting.** Classical examples of this are achalasia (cardiospasm), duodenal stenosis, congenital pyloric stenosis, volvulus and intussusception.

(*a*) *Œsophageal Stenosis and Achalasia* (cardiospasm or œsophagectasia). Generally speaking, the vomiting due to œsophageal stenosis or stricture commences in the first few months of life, or certainly by the age of one year.

when thicker foodstuffs are introduced into the diet. These symptoms persist. In such cases dilatation with bougies may allow thicker feeds, but thin starchy feeds may have to be given for an indefinite period. Using milk as a basis, and thickening this with vegetables, starchy preparations and beef extract, a balanced diet containing sufficient of the mineral elements may be obtained.

Achalasia is as a rule rarely found before eight or nine years of age. The symptoms are vomiting at or between meals, and failure to gain weight. An X-ray shows a spasm of the œsophagus, not at the bifurcation of the trachea, as in organic cases, but at the level of the diaphragm. The œsophagus shows dilatation above this point. Passing a mercury-filled stomach tube before meals rapidly relieves the spasm. The diet should be a concentrated one.

(*b*) *Congenital Pyloric Stenosis.* This condition starts at or shortly after birth and is characterised by large projectile vomits, marked constipation and failure to gain in weight. Usually the child is crying and restless and hungry. The condition is about six times as frequent in boys as in girls and is most commonly found in the first child. The diagnosis is made on the above history and symptoms and by seeing waves of gastric peristalsis passing from left to right across the epigastrium. On careful palpation in the upper right quadrant of the abdomen, just outside the right rectus, a pyloric tumour may be felt.

The medical treatment consists of daily gastric lavage (see p 153) and sometimes it is necessary to give two in the day. Normal saline (see p 152) is best used to wash out the stomach, not bicarbonate of soda.[1] The feed should be a thick one (see p. 119), unless breast milk is obtainable. One-thousandth of a grain of atropin-sulphate, or 1/500th of a grain of Eumydrin, should be added to each feed. This acts as an anti-spasmodic. Medical treatment is best

[1] Maizels M., McArthur, C. B., and Payne, W. W.: "Alkalosis in the Pyloric Stenosis of Infants," *Lancet*, February 8th, 1930, p 286

used in infants where the diagnosis has not been made until the tenth or twelfth week. As a rule all symptoms pass off at the sixteenth week, when the pylorus relaxes.

If surgically treated, Rammstedt's operation is the operation of choice, in which the muscle of the pylorus is incised in a longitudinal direction.

Post-Operative Feeding

Operation.

6 hours after operation: At hourly intervals 1 drachm of either:

1. Breast milk.
2. Humanised Dried Milk Mixture made up of one measure to each ounce of water.
3. Unsweetened condensed (evaporated) milk mixture (see p. 84).
4. Lactic acid milk and water mixture (see p. 76).

12 hours after operation: At hourly intervals 2 drachms of the feed chosen.

18 hours after operation: At intervals of one and a half hours, 3 drachms of the feed chosen, gradually increasing until

24 hours after operation: At two-hourly intervals, 1 oz. of the feed chosen.

If breast fed, allow the infant to nurse at the breast three-hourly from this ti[illegible]wards.

If not breast fed:

[illegible] hours after operatio[illegible] intervals, 2 oz.
[illegible]f the feed chosen
[illegible]rs after operati[illegible] mount for the
[illegible]'s weight.
Vomiting due [illegible] be due
[illegible] tho[illegible] or damage
[illegible] food

inf[illegible]

in the infant is always accompanied by diarrhœa, or, at least, undigested motions. Gastritis may be due to so-called gastric influenza, but it is more often secondary to a cold or tonsillitis. In such cases nothing should be offered by the mouth, if the vomiting is incessant, other than sips of some bland fluid, such as fruit juice and water, well sweetened with sugar or glucose. Barley water, freshly brewed weak tea, well-sweetened fruit juice or plain sugar water all are suitable. Should even these sips be returned, fluid must be given by the bowel, in the form of normal saline containing 5 per cent. glucose. If rectal salines are not retained, then the advisability of subcutaneous, intraperitoneal or intravenous saline and glucose should be considered (see Appendix).

In no case are these measures to be withheld if the infant has vomited for a period of twenty-four hours.

Where vomiting is marked it is best not to give bicarbonate of soda, because of the risk of alkalosis.[1] Occasionally, early on, if the infection is not very marked, *washing the stomach out* gently with normal saline until the mucus has been completely removed (see Appendix) will cause the vomiting to subside. The *bowels should be made to move* with some laxative appropriate to the age of the child. *Kaolin* or *bismuth carbonate*, given in drachm doses, tends to settle the stomach and lessen the retching.

The *return to full-cream diet should be made very* slowly. Skimmed or half-cream milks (see p. 49) should be given first, such as Horlick's Malted Milk or Skimmed Cow and Gate, followed later by one of the half-cream dried milks, then by starches in the form of one of the proprietary starchy foods or finely-ground cereals (see p. 53), before any full-cream milk is introduced.

(*b*) *Indigestion* (dyspepsia).

Protein indigestion, i.e., inability to manage milk curd or meat, is extremely rare and seldom causes vomiting. Should this be the case, a low protein diet for a few days is indicated, then the giving of lactic acid milk (see

[1] Maizels, M., McArthur, C. B., Payne, W. W.: "Alkalosis in the Pyloric Stenosis of Infants," *Lancet*, February 8th, 1930, p. 286

p 76), or dilute hydrochloric acid by the mouth in doses of from 10 to 30 minims in a little milk at meal times For methods of modifying curd, see p 61

Fat indigestion however, is much commoner Rich creamy milk is prone to bring about a bilious attack, which may culminate in violent vomiting and sometimes diarrhœa with pale motions The removal of the fat, in the form of cream, butter, much rich milk and the yolk of egg dripping olive oil and cod liver oil is indicated for the time being Bland drinks should be given, consisting of sugar water or well sweetened fruit juice or, if necessary glucose-saline rectally The fats can later be cautiously re introduced For a description of acidosis in older children see p 134

Carbohydrate indigestion (sugar indigestion) rarely, if ever, causes vomiting but diarrhœa may occur Starch indigestion in older children is described on p 137

The general measures taken for the treatment of dyspepsia or indigestion are the same as those for gastritis given above

3 Cerebral vomiting This is seen in brain tumour and meningitis In such cases the vomiting occurs irrespective of food or the times of feeding The feeding should not be altered because of the vomiting

4 Habit vomiting or rumination (merycism)[1] Overbright generally female, infants from the second or third month acquire the habit of being able to strain and regurgitate their food into the mouth, where it is re tasted and re swallowed Each time this is done a small proportion is wasted so that the pillow is continually wet The result is that the weight remains stationary, and one sees such infants at six or eight months weighing only 7 or 8 lb

Treatment Small concentrated feeds must be administered so that each ounce contains a large number of calories The greatest possible care should be taken to get the child to regurgitate its wind and to sleep as much as possible In such cases a grain of chloral hydrate

[1] Paterson, Donald: Rumination (Merycism) in Infants *Practitioner* December 1908

given before each feed is of advantage Some of the more useful foods are Savory and Moore's and Benger's Food, but any of the starchy foods used to thicken cow's milk mentioned on p 53 can be used

Simple directions for mothers for ruminating children are as follows The doctor should fill in the amount of the feed and the times of feeding, in the gaps below:

Feed baby at 6, 9, 12, 3, 6 and 10 p m or at 6, 10, 2, 6 and 10 p m At each feed give baby oz of this mixture (see tables on pp 92 and 94) Skimmed boiled cow's milk 1 pint, water ½ pint, sugar two level tablespoonfuls Warm this up in a saucepan and to it add two level tablespoonfuls of Savory and Moore's Food, which has been previously mixed to a paste with cold water Allow the whole to stand warm for ten minutes, then bring to the boil Two and a half ounces of this mixture should be offered for each pound body weight per day

See that the hole in the teat is large, so that the baby can get the feed in ten minutes easily.

Hold baby up for twenty minutes after each feed till the wind is broken twice Give orange or tomato juice, two or three teaspoonfuls, diluted with water and sweetened with sugar, daily. This is meant to supply vitamin C for the child's health and is not given as a laxative

5 Mechanical vomiting This is due to stimulation at the back of the pharynx and uvula, and causes retching Pus from adenoids, or sucking the fingers, may produce retching and straining and thus vomiting Splinting the arms will prevent finger sucking in such cases The cough and retching of whooping cough also comes into this category In this disease a small "substitute" feed *should be offered* n *quarter* of an *hour* before the regular meal Such a "substitute" feed often induces a paroxysm with vomiting and allows the child to retain its ordinary meal given immediately afterwards During the dentition period it may be due to the child gagging or choking over coarse or lumpy food

6 Vomiting due to stimulation of the vomiting

centre by general toxins or drugs. Bilious vomiting (acidosis) (see p. 134), uræmic vomiting, apomorphine and ipecacuanha vomiting fall into this group.

7. Aerophagia. Swallowing small quantities of air is a normal procedure for every infant (Fig. 4, facing p. 90). This may become a pathological process, however, if the infant is fed at an empty breast, or attempts to take its feed from a teat in which the hole is too small. Eructating large quantities of gas causes vomiting, and this type of infant loses much of its already deficient supply of food. The treatment for air swallowing is—

1. Make sure that the infant is being offered a sufficient supply of food for its needs (see pp. 92–95).

2 Offer it this food easily, so that it does not require to struggle, and does not take more than ten minutes at most over the feed.

3 Hold the infant up carefully so that it may "break the wind" without at the same time bringing up its feed with it.

4. Give 1 gr. of chloral three times in the day until it has got out of the habit of sucking in a frantic, famished fashion

In these cases, as a rule, the bowels are constipated, but we have many times known cases in which the mother states that after each feed the baby has a fluid green motion.

Constipation

Constipation in the Breast-fed Infant. Constipation is extremely frequent in the breast-fed infant, and the common causes and their treatment may be enumerated as follows :—

1. *Insufficient Fluid.* This is undoubtedly the commonest cause. In warm weather especially, the quantity of fluid taken is insufficient to keep the motion moist and allow it to be passed easily. The child should be given additional drinks of water, and by this is meant that the child should be offered from 2 to 4 oz. twice daily and allowed to take what it will of this. The giving of fruit juice at this time is often the custom.

2. *Overweight, flabby infants,* with no strength in the abdominal muscles, suffer from constipation, and the treatment is to reduce the diet on the whole, instituting massage and artificial sunshine.

3. *Irregular attention and bad management* on the part of those in charge of the child are extremely common. From earliest infancy it should be placed on the chamber at regular times for the purpose of a motion, in addition to the times when placed on merely to pass urine. If there is difficulty in getting the child to associate the chamber and his motion for the first few days, the anus may require to be gently stimulated with vaseline on the top of a soft rubber catheter or a glycerine suppository may be used. Once the association between the chamber and defæcation is established, the child will then perform as required.

4. *Fear of the act* of defæcation due to an anal fissure is an infrequent cause. The anus is sometimes torn or split whilst passing a large constipated motion, and the association of pain on defæcation is so fixed in the infant's mind that no effort is made. The application of a weak, half-strength hamamelidis ointment (*B.P.*) before each act, and keeping the motion soft by means of liquid paraffin emulsion should right this.

5. *Congenital anal stenosis* is more common than is generally supposed. Some children require very careful dilatation of the anus, best done with a well-vaselined little finger.

A little Semprolin, Nujol, Virolax or Petrolagar Emulsion, given as a routine night and morning, with occasionally some milk of magnesia first thing in the morning, is helpful to induce good habits.

If the breast-fed infant is under-nourished, constipation may be the first sign that the supply of milk is deficient. A series of test feeds will quickly show if this be so, and small complementary feeds of cow's milk following the breast feeds will both correct constipation and at the same time cause the infant to thrive.

Constipation in the Artificially-fed Infant. On the whole, the remarks regarding constipation in the breast-

centre by general toxins or drugs. Bilious vomiting (acidosis) (see p. 134), uræmic vomiting, apomorphine and ipecacuanha vomiting fall into this group.

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3. *Irregular attention and bad management* on the part of those in charge of the child are extremely common. From earliest infancy it should be placed on the chamber at regular times for the purpose of a motion, in addition to the times when placed on merely to pass urine. If there is difficulty in getting the child to associate the chamber and his motion for the first few days, the anus may require to be gently stimulated with vaseline on the top of a soft rubber catheter or a glycerine suppository may be used. Once the association between the chamber and defæcation is established, the child will then perform as required.

4. *Fear of the act* of defæcation due to an anal fissure is an infrequent cause. The anus is sometimes torn or split whilst passing a large constipated motion, and the association of pain on defæcation is so fixed in the infant's mind that no effort is made. The application of a weak, half-strength hamamelidis ointment (B.P.) before each act, and keeping the motion soft by means of liquid paraffin emulsion should right this.

5. *Congenital anal stenosis* is more common than is generally supposed. Some children require very careful dilatation of the anus, best done with a well-vaselined little finger.

A little Semprolin, Nujol, Virolax or Petrolagar Emulsion, given as a routine night and morning, with occasionally some milk of magnesia first thing in the morning, is helpful to induce good habits.

If the breast-fed infant is under-nourished, constipation may be the first sign that the supply of milk is deficient. A series of *test feeds* will quickly show if this be so, and small complementary feeds of cow's milk following the breast feeds will both correct constipation and at the same time cause the infant to thrive.

Constipation in the Artificially-fed Infant. On the whole, the remarks regarding constipation in the breast-

fed apply to those artificially fed, but in addition there are other factors.

It is usual for every infant who is fed on cow's milk to be slightly constipated, as judged by the normal breast-fed infant. Undoubtedly, however, the greatest factor in the constipation of the bottle-fed infant is the failure of those in charge to realise the importance of regularity in the matter of bowel habits. Just as in the case of the breast-fed infants, the child's bowels must be made to move at a specific time, that time to be adhered to with the utmost regularity.

The balance of the different elements, protein, fat and carbohydrate, influences constipation considerably. High protein or curd feeds—that is, the giving of too much cow's milk in the day—tends to produce alkaline constipated motions. On the other hand, an excess of sugar, which ultimately ferments into the lower fatty acids, excoriates the bowel, and increases peristalsis, with frothy acid motions, and produces diarrhœa.

An excess of fat will, for the time being, produce constipated, grey, crumbly motions, but later diarrhœa. It will be realised, then, that a nice balance must be aimed at between constipating protein and diarrhœa-producing sugar and fat. It should be understood that it is distinctly pathological for the motions of the artificially-fed infant to be acid, and the doctor should be on his guard ready to reduce sugar if this is so.

Having made certain of the regular habits of the artificially-fed infant, the practitioner will do well to increase cautiously the sugar in an effort to increase the acidity of the bowel contents. As a rule, this increase of sugar hastens the child's gain in weight. The dictum that "a constipated bottle-fed infant is an invitation to add sugar to its diet" is in most cases true.

The giving of olive-oil, extra cream, and especially doses of castor-oil is to be strongly condemned.[1] A teaspoonful of milk of magnesia in the early morning bottle two or

[1] Paterson, Donald: "The Uses and Limitations of Cream in Infant Feeding" *Lancet*, April 23rd, 1927, p. 870.

three mornings in the week will also aid in getting the child into right habits. Liquid paraffin emulsion, as Semprolin Emulsion, Nujol, Sagradol, Angier's, or Petrolagar, given night and morning, is most useful, and also the addition of orange, tomato, or prune juice to the daily diet.

In older children any error in the management of the child over the movement of its bowels is followed by a greater or lesser degree of constipation. Good habits should be maintained with machine-like regularity; as early as possible the meals should be reduced to three in the day, and what cereals are given should be of the coarse variety; rusks, crisp toast, or wholemeal bread, instead of soft bread and butter; finely chopped up spinach, sprouts, greens or cabbages, which are not absorbed and tend to give bulk to the motions, thus preventing constipation. An abundance of fruit, especially prunes or figs, is to be encouraged. Exercises for the abdominal muscles should be instituted where the child has the lax, pendulous abdomen which is so typical of the "flabby child."

Probably the most important point is for the mother or nurse to be able to instil into the child the will to try to have a motion. This cannot be done by coaxing or threats, but by a studied air of unconcern and optimism. The child should on no account be allowed to think that the failure of his bowel movement is of the slightest importance. At this age, just as in infants, the liquid paraffin preparations will be found a great help to establish regular bowel movements.

Stools in Infancy[1]

The character of the stool depends on the food ingested. *Too great reliance should not be placed on its* appearance, however, as apparently normal motions are often passed by a child with severe intestinal lesions. Infants are sometimes kept on a starvation diet until the

[1] Paterson, Donald "Normal and Abnormal Stools in Infancy." *Maternity and Child Welfare*, July, 1923.

stool shall become less green and assume a yellow tint, but this shows a total lack of understanding of the problem, as until a feed is given nothing but unchanged bile will be passed and the stool will remain green.

The Normal Stool. *Breast-fed Infants.* Immediately after birth three or four dark green, or almost black, tarry stools, composed of meconium, are passed. These contain bile, intestinal *débris*, shreds of skin and hair, the latter having been swallowed with the amniotic fluid. As the child commences feeding, first on colostrum and later on normal breast milk, the stools become lighter in colour. They are of a salve-like consistency, and the colour is now golden-yellow or mustard colour, having a slightly acid or sour smell, which is not offensive. They are acid in reaction to litmus paper. The number of stools tends to decrease, so that by a month there may be three, and by two months about two stools per day. The colour and odour remain the same, although the consistency tends to become more solid.

Artificially-fed Infants. The normal stool of the artificially-fed infant is different from that of the breast-fed infant, and varies with the feed given. Feeds high in protein or high in fat produce different stools from the skimmed milk feeds or lactic acid milk feeds. Each of these stools, however, is normal for the particular feed. On the whole, the artificially-fed infant's stools are similar in quantity and fewer in number than those of the breast-fed infant. They tend to be less yellow or mustard-coloured, being paler and more formed. They might, in fact, compared with those of the breast-fed infant, be considered constipated stools. The odour is more offensive and there is a tendency for the stools to be alkaline to litmus.

High protein feeds, or feeds containing much undiluted cow's milk, produce grey, offensive, alkaline motions, which are constipated or crumbly. *Starchy or sugary feeds* tend to produce less formed motions with a more acid reaction to litmus, and give a slightly more yellow or brown colour to the motion. *Malted foods* give a

definite chocolate tint to the motion *Buttermilk* or buttermilk mixtures produce stools of a shiny olive-green, with a characteristic odour

Reaction of the Stools Strongly *acid stools* are due to a feed excessive in fats or carbohydrates Fats split down into fatty acids, and both fats and carbohydrates tend to split into lower fatty acids, producing loose, bubbly motions with an acrid odour

Alkaline motions tend to be formed in character, and are due to an excess of protein in the diet Whole skimmed milk or an excess of a skimmed dried milk with a deficiency of carbohydrate tends to produce such a stool

Stools may be passed acid, but become alkaline on standing, or *vice versâ*, and should therefore be tested immediately after being passed

Colour of the Stools Occasionally a stool is passed a golden yellow, and *on standing* becomes *bright green* This is due to an oxidation of the bile constituents, and is of no particular importance Scraping beneath the green surface, it will be found that the interior of the stool is yellow

Green Stools The green colour of a stool is due to the presence of bile Bilirubin and biliverdin are the pigments most usually found If peristalsis be increased for any reason, such as over purging or some bacterial infection of the bowel wall, and the intestinal contents be hurried along, preventing the proper change from the green to the yellow pigment then one must expect green stools In the so called hunger stool, well seen in pyloric stenosis, little else than bile and the bacterial *débris* of the intestine is to be found Such a stool is dark olive green Feeds low in fat tend to produce greenish stools Fat, when present, gives the stool a lighter and slightly yellower colour The green acid stools of fermentative diarrhœa are not directly related to the presence of sugar, but to the increased peristalsis of the bowel, consequent on the excessive acid production

Grey Stools These are usually the result of *high fat*

feeding, and they may be semi formed or formed and crumbly. A high proportion of soap will be found in such stools. With a continued excess of fat the reaction becomes more acid and the grey colour disappears as peristalsis is increased, yellowish *curds* and a *green*, *bile*-coloured stool resulting. In coeliac disease the stools are large, offensive-smelling, grey or putty-coloured and semi-formed. An analysis of such stools shows a great excess of fat to be present, chiefly in the form of soaps

White Stools. These are due to a great excess of fat or an absence of bile. The classical example is that of the jaundiced child, especially in cases of congenital obliteration of the bile ducts.

Black Stools. These may be due to the presence of blood, and are described as tarry. They are well seen in melæna neonatorum. Drugs such as bismuth, iron or charcoal also give rise to dark or black stools.

Abnormal Constituents in the Stools. *Curds*. It is usually assumed by the general public that all curds are casein curds. The curd most often found in stools, however, is composed almost entirely of fat caught in the meshes of a small proportion of casein. Such curds are soft and easily broken up. If placed in ether they tend to dissolve. These are the common curds of the infant's *stool, whether it is breast fed or artificially fed. With the* use of a lower fat feed such curds tend to disappear.

True protein or casein curds are relatively uncommon, unless the milk given is unboiled. They are large, bean-shaped, and have a brownish, semi-translucent appearance. When placed in ether they do not dissolve, and with formalin they become hard and tough. They sink in water. Protein curds can be abolished by the addition of cereals to the feed, by boiling the milk and by the addition of alkalies (see p 62).

Blood. Blood in the motions is most commonly due to an anal fissure in an over-nourished child, who is constipated. In such cases the blood is smeared on the outside of the formed motion. Clots of blood or dark, tarry motions in the new-born infant suggest melæna

neonatorum In older infants the red currant jelly motion together with spasms of pain, suggests intussusception In mucous colitis the blood present is in small flecks mixed with much mucus, rather than large clots Dysentery and rectal polypi are rare causes of bleeding in children

Mucus Mucus in the motion suggests catarrh of the bowel If it is intimately mixed with the stool it is probably from the small intestine, whereas when clinging to the surface of the motion it is more usually from the colon Intestinal catarrh may be either due to an unusual chemical substance, such as excessive acid in the motion, or to some bacterial infection, such as a dysentery organism

Pus Pus is present in severe inflammation of the bowel Shreds of mucous membrane are found with it in mucous colitis

Worms Thread worms, round worms and segments of tape worms are the usual varieties found in the British Isles There are usually many thread worms present at one time, and they can be seen moving like tiny white threads from ¼ to ½ inch long Round worms are like those seen on a golf course after rain and segments of tape worm are oblong and white and about the size of the little finger nail The presence of worms in a stool should be easily observed by any intelligent person on examination

Undigested Vegetables Such vegetables as spinach, sprouts, and carrots are readily seen in the motions of infants or young children The giving of vegetables should not be abandoned, however, because of this normal occurrence

Morse J. L. and Talbot Fritz B.: Diseases of Nutrition and Infant Feeding (Macmillan, New York) p. 77

CHAPTER VIII

WASTING IN INFANCY AND THE PREMATURE INFANT

Wasting (Marasmus or Malnutrition)

When an infant fails to gain weight the practitioner should ask himself two questions —

1 Has this child some gross organic lesion in one of its organs, i e, congenital heart disease, congenital atelectasis of the lungs, interstitial nephritis, polycystic kidneys, congenital syphilis, tuberculosis, or congenital pyloric stenosis ?

2 If not, is the feed large enough, and does it contain the proper balance between the various elements and contain the necessary vitamins ?

We do not intend dwelling on these cases suffering from gross organic disease of some organ These must be treated elsewhere A thorough examination of the child, together with an examination of the urine and blood, and, if necessary, an X ray of the chest, will in most cases reveal the organic disease if it be present

Having excluded organic disease, the practitioner should attend to the following points —

1 A calculation should be made of the total twenty four hours' dietetic intake of the child in order to estimate if sufficient food is being taken to make the child thrive

2 Make sure that enough sugar is present to balance up or burn the other elements in the diet, this is a common fault which prevents gain taking place

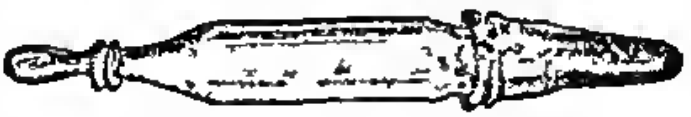
3 Make sure that the hole in the teat is large enough so that the child can get the whole feed in ten to fifteen minutes, this point should be insisted upon

The Premature Infant [1, 2]

The feeding of the premature infant is often one of some difficulty, and faulty feeding in the presence of prematurity may result in the loss of the child

Premature Infants nursing at the Breast. If the infant is strong enough to suck properly, and there is an adequate supply of breast milk, it should be placed to the breast three-hourly during the second twelve hours after birth, and thereafter. When there is little milk, a supply of human milk should be obtained whenever possible and given to the new-born infant. Breast milk is now always obtainable at Queen Charlotte's Maternity Hospital, Marylebone Road, W.1. Occasionally one takes advantage of the fact that when a strong, healthy child is suckling one breast the milk tends to flow from the nipple of the opposite breast. By placing the premature child to this opposite breast it gets its supply of milk almost without effort.

If the infant is too weak to nurse at the breast it should not be removed from the cot. A small nursing bottle with a specially small teat through which the milk flows easily may be used, the breast milk having been drawn off from the mother by means of a breast pump, or, better, by manual expression (see p. 154). The Premature



Tube Feeder (Bell & Croyden) is a good type of bottle to use for this purpose. A teat may be made from the rubber top of a medicine dropper by piercing a suitable hole in it. A Breck Feeder will also be found useful This may be made by placing the teat of a perforated medicine dropper over one end of the barrel of a urethral syringe and covering the other end with a finger stall or another imperforate

[1] "The Care and Feeding of the Premature Infant," Donald Paterson, *Post Graduate Med Journ*, June, 1927, p 130

[2] "Premature Infants," Julian H Hess, "Abt's Pediatrics," Vol II, p 437.

teat. When this is filled the milk is expressed into the mouth of the infant with little or no exertion on its part. Should the baby entirely refuse to suck or be too ill to take its feeds in any of these ways, it may be fed by means of a nasal catheter every few hours.

Infants under 3½ lb. should be given two-hourly feeds by day and three-hourly by night, that is, at 6, 8, 10, 12, 2, 4, 6, 9, 12, 3. Those above 3½ lb. can be fed three-hourly during the day and four-hourly at night, that is, 6, 9, 12, 3, 6, 10, 2. Owing to the lack of any reserve in the premature baby, if the mother has very little milk until the third day, either breast milk should be obtained from a foster-mother or a maternity hospital, or an artificial feed should be given. About one sixth to one-eighth of the infant's body weight in fluid is required every day, so that whilst lactation is being established the baby must be given water, sugar water or whey. This is the more important when we remember the temperature in which it is usually necessary to nurse such a baby.

At birth this infant requires 1 oz. of breast milk per pound of its body weight per day. By the fourth day it requires at least 2 oz., and by the tenth day 3 oz. of milk per pound body weight. No appreciable gain of weight will be noted until the intake of food has reached 3 oz. of breast milk for each pound weight. It will be seen, then, that a premature infant of 4 lb., a fortnight old, requires 12 (4 × 3) oz. of breast milk in the day, a quantity sufficient for a strong, healthy, full-term infant weighing 6 lb at the same age.

Artificial Feeding. The relatively large quantities of food required by premature infants increases the difficulty of finding a suitable artificial feed for them, and emphasises the necessity of establishing lactation in the mother by the means already described (Chapter II.) or obtaining breast milk from other sources. Because of the more difficult digestion of cow's milk protein, relatively small quantities must be fed to the infant, with consequent less chance of gain in weight. They usually tolerate sugar

well, and, although the curd digestion may be overcome to some extent by peptonisation, as a practical measure, it will usually be found that a condensed (evaporated) milk—low in protein and high in sugar—offers one of the best substitutes for breast milk in feeding premature infants.

The unsweetened condensed (evaporated) milks may be "humanised" by taking one part of condensed (evaporated) milk to three parts of water and adding one slightly rounded teaspoonful of sugar to each 4 oz. of the mixture. This can be substituted for breast milk, allowing as before that each pound body weight requires 3 oz. of breast milk per day or 3 oz. of this unsweetened condensed (evaporated) milk mixture. A 4-lb. premature infant would theoretically require 12 (4 × 3) oz. of this humanised milk in the day, but in practice it may be found that such an amount causes some indigestion, and it is better to give the 4-lb. baby 10 oz. of such a mixture rather than to upset it by giving the full theoretical requirements.

If cow's milk is used as the artificial feed, it will give better results when converted into lactic acid milk (see p. 76).

As in full-term infants, dried milks appear to be more easily digested than raw milk, and many premature babies can be successfully reared on one of the dried milks. These should preferably be "humanised" when used to feed a premature infant, and there are now several humanised dried milks on the market, such as Frailac, Sunshine Glaxo, Humanised Trufood, Humanised Cow and Gate, which, on the addition of 1 oz. of water for each measure of the dried milk, make up a mixture similar in composition to breast milk. The choice of an artificial feed for the premature infant *after all attempts to obtain breast milk have failed* may be made from one of the following: A "humanised" mixture of unsweetened condensed (evaporated) milk. Lactic acid milk. Humanised dried milks. Full-cream dried milks—modified by peptonisation. Modified cow's milk—especially when peptonised. Sweetened condensed (evaporated) milk one in twelve.

It must not be forgotten that in some infants cyanotic attacks besides being due to atelectasis of the lungs, may be due to dehydration, and if the quantity of food, especially water, is increased the attacks may be aborted. The treatment of the "blue turn" at the time lies in the administration of oxygen and CO_2.

There are several difficulties in getting the premature infant to nurse which may be mentioned :—

1. Sometimes the child tends to sleep so soundly that it cannot be wakened for its feed.

2. The mouth is often in these weakly infants infected by thrush, causing the infant to refuse a feed owing to the pain of swallowing. The disinclination to feed on the part of a premature infant is serious, and may at times be overcome by dropping one feed and substituting half strength saline.

Of late years these feeding difficulties in the premature infant have been largely overcome, the feed being administered by means of a *stomach tube*. A fine rubber catheter is passed at each feeding time, and with a small funnel, or using the barrel of a 10 c.c. syringe as a funnel, the feed is poured down. The infant has thus no work to do and is not exhausted by having to suck. In addition, it swallows no wind, and therefore does not require to be picked up and held upright after the feed. The authors have had most striking successes with this method.

There is a tendency to develop anæmia and rickets in these cases. The former may be prevented by giving iron and ammonium citrate, one grain three times daily to commence with, and the latter by seeing that cod-liver oil or halibut-liver oil is given as soon as there is no danger of its producing a gastro-intestinal upset.

CHAPTER IX

DIETS FOR SICK CHILDREN

It is impossible to over-estimate the importance of diet during the illness of children. An endeavour is here made to indicate what diets are necessary in these circumstances.

(I.) **Fat Dyspepsia in Older Children** (so-called acidosis attacks). Usually this type of child, who has a low fat tolerance, has been termed by his parents as "thin and nervous," or "liverish," or "gastric," or inclined to have "acidosis attacks." As a rule, the general complaint is of lack of appetite, and a dirty tongue, bad breath, and failure to gain weight. Such a child becomes easily tired and nervous. Often there is a history of an attempt to feed up a thin frail child by pressing milk, cream, butter and eggs. With any *slight* infection vomiting commonly occurs, but occasionally diarrhœa is present. The tendency to digest and assimilate fat badly may be an inherited one, *but the actual factor which precipitates an attack is almost invariably an infection, usually of the tonsils and adenoids.* These children are, therefore, prone to chills on the liver, or mysterious feverish turns accompanied by profuse vomiting, when not even water is kept down. They make up the group of so-called cyclical vomiting. The authors feel that the problem in such cases is not primarily a dietetic one. That is, the attacks are preceded by occasional infections, and although by keeping the child on a low fat diet the attacks are shorter, and of much less severity, nevertheless, they do not feel that anything more than a very temporary lowering of the fats in the diet is warranted in such cases.

Low Fat, High Carbohydrate, Anti-Acidosis Diet

(for Temporary Use Only)

On Waking

A glass of orange, grapefruit, or tomato juice, sweetened with four lumps of sugar or two teaspoonfuls of glucose

***Breakfast* 8 a m**

1. One of the following cereals Porridge, Groats, Cream of Wheat, Force, Puffed Rice, Shredded Wheat, Grapenuts, served with a very little skimmed milk, and well sweetened with sugar (See that the child's appetite is not satisfied with this course)
2. Twice a week an egg (remember that the yolk of an egg is almost pure fat), three or four times a week give tomatoes and crisply fried, very thin, rashers of bacon (fried until the fat has been mainly removed and allowed to drip, so that a minimum of fat or grease remains) Fish should be given on one or two mornings, also lightly fried liver
3. Crisp toast and butter
4. Freshly brewed tea, or Horlick's Malted Milk, or well skimmed milk and water (equal parts) one cupful only

Mid morning

A plain biscuit or soma fruit, such as an orange or orange juice, or an apple, or glucose, or a plain boiled sweet (No milk.)

Dinner (say 12 30, as it is best to have an early dinner with these children)

1. Underdone beef steak, stew, cutlet, chicken, fish or brains, or occasionally a little lightly fried liver
2. Potato cauliflower, turnips, parsnips, carrots, peas, beans, or green vegetables (including steamed lettuce)
3. Milk pudding and stewed fruit, or steamed pudding (without suet)
4. Water to drink

Tea* 4 30 *to* 5 *p m

1. Thin bread and butter, crisp toast or pulled bread (Zwieback), with stewed fruit, jam, treacle, honey, golden syrup and a sponge cake
2. Drinks The same as at breakfast (In winter, a bowl of broth or a little milk pudding may be given at this meal)

Bedtime*, 6 30 *to* 7 *p m.

Nothing more than a plain biscuit or soma glucose should be given, the teeth being carefully cleaned after this

Sweets

Plain boiled sweets such as barley sugar (Barley Malta or Barley Brights) or fruit drops or Mackintosh's toffee, should be offered after dinner or tea, the teeth to be cleaned immediately afterwards

Milk

This should have the cream removed (skimmed) and not more than three quarters of a pint is to be given in the day, including that used in cooking

Glucose (powdered)

This is the best form for children and should be given at intervals, when required

Cod liver Oil.

This should be avoided as it tends to produce livenish attacks Plain malt, or malt and iron, should be substituted, together with one drop of halibut liver oil three times daily, or a few drops of Ostelin or Radiostoleum is indicated.

Things to be taken with caution because of their high fat content Milk, butter, eggs, cream, pastry, suet pudding chocolate or cocoa.

Treatment. The vomiting attacks can only be prevented by removing infections. The quantity of fat readily tolerated in health becomes grossly excessive in the presence of an infection, and results in ketosis with excretion of acetone in the urine.

By dropping temporarily the moderate amounts of fat, which the child normally tolerates, to the lowest possible level, at the least sign of infection, the formation of acetone and consequent vomiting is minimised. The diet recommended as a *temporary measure only*, is as above.

Great attention must always be given to the bowels, grey powder, milk of magnesia, or rhubarb and soda being the most useful aids for this purpose.

The treatment of Acute Acidosis Attacks. The child prone to have a poor tolerance for fat gets, at intervals, an infection which is accompanied by acute vomiting. The onset is very often extremely sudden, and the prostration great

If an attack is suspected, one to two teaspoonfuls of sodium bicarbonate can be given, spread over the day, in various drinks. It is useful, therefore, as a prophylaxis. Once the vomiting has commenced, however, it is wrong to give sodium bicarbonate. The proper treatment then is the administration of sugars, especially *glucose* It is very often best for a few hours to cease fluids by mouth altogether, giving normal saline with 10 per cent. glucose rectally, or saline with 2 per cent. glucose beneath the skin. In very severe cases intravenous saline and glucose (2 per cent.) should be given at once, as this condition may prove fatal. It is safe to give up to 2 oz. of glucose in the first twenty-four hours. To keep the mouth moist, barley sugar may be sucked. Occasionally, a little syrup or honey, together with thick cereal (made with water) is kept down, and if so the formation of acetone is quickly checked.

Feeding. Once the vomiting has ceased, as much fluid as possible should be given, but milk and other fats should be withheld for a day or more One of the

skimmed dried milks, or malted milks such as Horlick's, should be commenced with Starches such as porridge, potatoes, and rice pudding should next be given, and finally the ordinary normal diet slowly resumed

(II) Starch Dyspepsia In the child with carbohydrate indigestion or starch dyspepsia, the abdomen is seen to be distended and pendulous, and all the muscles are extremely *flabby, but he is well covered* Such children are windy, sleep badly, and are inclined to have bouts of constipation alternating with diarrhœa The motions when passed are frothy and acid, tending to burn the child An examination of the stools under the microscope will show much undigested starch present, which readily stains blue with iodine It is characteristic that these children have voracious appetites at times and seldom chew their food properly They are soft and flabby and have been named by Scotch pædiatricians "bread and butter" children

The *chief points in correcting the diet* are the reduction of the total quantity of starches, and offering such starches to the child in a more readily digestible form Any cereal given should be cooked for from one to two hours in a double saucepan, thus ensuring that all the starch granules are properly split Bread should be given as pulled bread (Zwieback), Ryvita crispbread, stale white bread, which has been baked and toasted, or well crisped rusks Potato must be given sparingly and the green vegetables given in purée form only Floured rice (cream of rice) is the best form of rice to be given With this *régime* the large distended abdomen tends to disappear steadily

Drinks Such children are inclined to drink much water between meals This practice should be discontinued, *allowing fluid at meals only, and then in carefully* considered quantities

One of the commonest sights, especially among the well to do, who are often attracted by the cult of a no red-meat diet, is a child with *knock knee and flat feet* These children have been rachitic as infants, and when older

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skimmed dried milks, or malted milks such as Horlick's should be commenced with Starches such as porridge, potatoes and rice pudding should next be given and finally the ordinary normal diet slowly resumed

(II) Starch Dyspepsia In the child with carbohydrate indigestion or starch dyspepsia, the abdomen is seen to be distended and pendulous, and all the muscles are extremely flabby, but he is well covered Such children are windy, sleep badly, and are inclined to have bouts of constipation alternating with diarrhœa The motions when passed are frothy and acid, tending to burn the child An examination of the stools under the microscope will show much undigested starch present, which readily stains blue with iodine It is characteristic that these children have voracious appetites at times and seldom chew their food properly They are soft and flabby and have been named by Scotch pædiatricians "bread and butter' children

The chief points in *correcting the diet* are the reduction of the total quantity of starches and offering such starches to the child in a more readily digestible form Any cereal given should be cooked for from one to two hours in a double saucepan thus ensuring that all the starch granules are properly split Bread should be given as pulled bread (Zwieback) Ryvita crispbread, stale white bread, which has been baked and toasted, or well crisped rusks Potato must be given sparingly and the green vegetables given in purée form only Floured rice (cream of rice) is the best form of rice to be given With this *régime* the large distended abdomen tends to disappear steadily

Drinks Such children are inclined to drink much water between meals This practice should be discontinued allowing fluid at meals only, and then in carefully considered quantities

One of the commonest sights especially among the well to do, who are often attracted by the cult of a no red meat diet, is a child with *knock knee and flat feet* These children have been rachitic as infants, and when older

have been kept on an extremely low protein *régime* Breakfast has been purely a starchy one, and the only protein given at dinner has been gravy or fish or an egg This low protein diet necessarily entails a high carbohydrate intake, and invariably results in a large, beautiful, very soft and flabby child From the age of one year onward, children can manage protein at both breakfast and dinner with great benefit to themselves, and in this way their starch intake can be rigorously curtailed [1]

Diet in Scurvy The treatment of a case of scurvy consists of giving adequate quantities of Vitamin C As scurvy does not occur under the age of six months a mixed diet is always to be recommended A pint of scalded cow's milk is given per day in place of any patent or dried food which the child is having An attempt should be made to get the child on to the diet sheets on pp 99–100 the diet for a normal child of the appropriate age Two to three tablespoonfuls of orange or tomato juice should be given during the twenty four hours, well diluted and sweetened, for a period of three days After this the amount should be reduced to one tablespoonful per day Potato cream, that is, well boiled mashed potato, to which has been added a little milk and the whole stirred into a cream, is useful It can be added one or two teaspoonfuls to each bottle for three or four days

The baby should be handled as little as possible until the scorbutic lesions are healed by the giving of a diet rich in water soluble vitamin C, such as the above

Diet in Rickets The diet plays an important, but not an exclusive, part in the treatment of rickets It should be a well balanced diet containing all the food elements A pint of milk should be given daily to ensure a sufficient amount of calcium, and for children above nine months two to three eggs per week ensures a sufficient quantity of phosphorus Great care should be taken that the child is not being overfed on the diet as a

[1] The Hypotonic (Flabby) Child Donald Paterson, *Brit Med Journ* February 14th 1925

whole, and is not overweight, soft and flabby because of this.

Some form of cod- or halibut-liver oil should be given, either as cod- or halibut-liver oil and malt, plain cod- or halibut-liver oil, cod-liver oil emulsion, such as Scott's Emulsion, or one of the ergosterol preparations, such as Radiomalt, Radiostol, Vigantol, Ostelin, Ostamalt or Vitamalt or Calciferol.

In addition to the diet, the child should have light clothing, and plenty of exercise is absolutely necessary, the child being allowed to kick and move its limbs freely. It should not be cooped up in a cot or pram many hours daily because of its condition.

Direct exposure of the skin to the sun's rays, so that the face, arms and legs are brown, and in the summer months the whole body, is most beneficial. In winter a course of artificial sunlight takes the place of the natural sun. General massage to all the muscles will hurry the cure.

Diet in Nephritis. In *acute hæmorrhagic nephritis* without œdema, where the urine is a bright red or port wine colour, the diet should be a bland one. Well-diluted milk and water, thickened with starchy foods, fruit juice and abundant cereals, are indicated. Additions to the milk should be in the form of starchy patent foods, rice or *potato, soaked rusks or toast.*

As the hæmorrhagic nephritis improves, septic foci such as bad teeth and tonsils, and discharging ears must be dealt with, or there will be a tendency for recurrence and an incomplete cure. There should be no return to red meat or eggs until the blood has completely cleared from the urine, but white meat, such as fish or chicken, should be cautiously added as the urine improves, and fresh vegetables in purée form should appear early in the diet.

During the *acute stages of parenchymatous nephritis* with œdema, the diet should be very similar to that just mentioned. Red meat, eggs and other albuminous substances are contra-indicated, and milk drinks should be

thickened with groats, Benger's Food, Savory and Moore's Food, Cream of Wheat, etc.

In *chronic parenchymatous nephritis* (*nephrosis*) a great diversity of opinion as to the diet exists. Children kept on a very low proportion of protein tend to become anæmic and to lose immunity to infection. Epstein's diet, with a high proportion of protein, quite apart from the raising of the blood urea, and therefore indirectly causing a diuresis, is most beneficial from a health standpoint.

Milk and orange juice are suggested by some schools as the ideal diet in this disease. It is probable, however, that a diet approximately that of a normal child is most beneficial once the subacute or chronic stages have been reached, but in cases with marked œdema both the salt and the fluid intake should be restricted.

Although the food recommended is that suitable for a normal child, the quantities of the total food in the day will, of course, vary with the amount of exercise and the child's output of energy. If confined in bed a more restricted quantity will be necessary than if able to get up and about.

In *interstitial nephritis*, which is rare, a diet low in protein, moderately high in fats and high in carbohydrates, is necessary.

Diet in Diabetes. In addition to the use of insulin in the therapy of diabetes, the correct dieting of a diabetic child is of the utmost importance, since not only the control of the diabetes is required, but the child must have those elements present which will ensure growth and guard against ill-health. The diet given on p. 141 is a useful one to commence with, but it may have to be modified for the individual case. Most elaborate diets and information can be found in MacLean's book, "Modern Methods in the Diagnosis and Treatment of Glycosuria and Diabetes" (*Constable & Co.*), and "Food Tables," G. A Harrison and R. D. Lawrence (Skinner & Co.).

The most modern tendency is to feed the diabetic child on a normal diet—controlling the carbohydrate by

SPECIMEN DIET FOR DIABETIC CHILD OF SEVEN YEARS

	Weight[1] in Ounces	Calorie Value in Grammes		
		Carbohydrate	Protein	Fat
Breakfast				
Fried bacon	1	—	5	15
Fried egg	—	—	0	5½
Bread fried in bacon fat	½	5	1	5
Pears stewed without sugar	1½	2½	—	—
Force	½	5	½	—
Milk	6	9	6	6
Coffee to drink.				
		21½	18½	31½
Dinner				
Raw beef (Beef stew)	2	—	10	½
Potato (Beef stew)	3	15	3	—
Cooked carrots (Beef stew)	1	2½	½	—
Cooked turnips (Beef stew)	2½			
Milk	6	9	6	6
Ground rice (Ground rice pudding)	½	10	—	—
Butter (Ground rice pudding)	½	—	—	15
Apples stewed without sugar	5	10	—	—
		46½	19½	26
Tea				
Pressed Beef	1½	—	10	12
Bread	½	5	1	—
Butter	½	—	—	10
Milk	4	6	4	4
		11	15	26
Supper				
Bread	½	5	1	—
Butter	½	—	—	10
Bread	½	5	1	½
Orange	3½	10	1	—
Milk	4	6	4	4
		26	7	14½
Total for the day		105	60½	97

a larger quantity of insulin where necessary Cod liver oil emulsion or one of the ergosterol preparations (Ostelin, Vigantol or Radiostol) should be given daily The urine must be tested each time it is passed and a record kept When the appearance of diacetic acid acetone or sugar is noticed, the next meal must be adjusted accordingly

It should be borne in mind that a slight infection,

[1] A new penny weighs ½ oz.

especially tonsillar or the common cold, in a diabetic child will produce acetone and diacetic acid in the urine, with acute ketosis, needing the most careful dieting Even with the greatest care in calculating a diet there is still a great unavoidable margin of error The difference between a sweet and a bitter orange, fat and lean meat, new and old bread, is obviously very great, and yet as a rule is not taken into account

The amount of exercise the child takes is often of the greatest importance, as under-exercise may allow sugar to appear in the urine and over-exercise may produce a hypoglycæmia With drastic purges also hypoglycæmia is often precipitated

The greatest care about the testing of the urine must be maintained, as children, unlike adults, tend to pass into a state of coma suddenly from some acute infection or dietetic indiscretion, however good their condition may appear

The day's menu given on p 141 provides an example of the diet of the diabetic child from seven to nine years old, and how it should be calculated, but it will be readily understood that the amount of carbohydrate which can be tolerated will vary with the severity of the disease

Diet of the Overweight Child In cases of overweight or adiposity in childhood, dieting is all important No amount of thyroid or exercise will take the place of a restricted and well chosen diet *It is essential that the child should feel the need for a reduction in weight and co-operate fully*, or success is impossible

In planning an overweight child's food the points given in the following diet should be remembered

Suggested Diet for Overweight Children

Breakfast

1 Raw fruit orange grapefruit or apple
2 Plasmon Oats or Energen cereal products (Avoid cereals such as porridge Cream of Wheat Puffed Rice Cornflakes etc.)
3 Lean bacon cold tongue lean ham fish or a soft boiled egg minus most of the yolk (not more than three per week)
4 Callards bread or biscuits or Energen wholemeal bread or bran biscuits are helpful at this meal. (Toast ordinary bread and biscuits are all extremely fattening and should be taken in very small quantities Try to manage with one small slice of bread only at this meal.)
5 Plain water or freshly brewed tea (with very little sugar) orange or lemon water or half a glass of milk.

Dinner

1 A liberal quantity of red or white meat of any sort or fish may be given
2 Fresh vegetables may be given in abundance such as Lettuce spinach cabbage cauliflower asparagus celery onions tomatoes parsnips and carrots Potato must be taken with great caution Try to manage with a piece not larger than an egg
3 Fresh or stewed fruit apples pears grapes peaches plums cherries pineapple and rhubarb dried fruits prunes figs raisins and dates (Avoid milky and suet puddings and custards.)
4 Water to drink.

Tea

1 Lettuce or tomato sandwich or two or three Energen digestive biscuits
2 Cup of tea

Supper

1 Salads or soups (excepting vegetable soups)
2 A little fish (boiled steamed or baked) or fish mayonnaise or cold tongue
3 One rusk or a small portion of Ryvita crispbread or Energen whole meal bread or bran biscuits
4 Drinks as at breakfast

Articles of food which should be given with caution on account of their tendency to fatten:—

Sugar (including all sweets chocolates sweet jams honey and syrups)
Starchy Foods (such as porridge bread potato and rice pudding)
Fatty Foods (such as butter cream and eggs)
Drinks Cocoa Ovaltine and dried milks should be avoided Keep to plain water or weak tea, or cow's milk (a pint a day)

Foods that are not fattening Meat fish soups (except vegetable soups) salads and green vegetables fruit (raw and stewed) without much sugar
Ryvita crispbread and Energen and Callards food products (with very little butter)

Milk In a growing child despite the tendency to overweight a pint of milk should be given daily to ensure good teeth and adequate bony growth

The authors have not found it necessary to give thyroid or pituitary in the ordinary case of adiposity, which is so often exogenous in origin. Endocrine therapy should be reserved for those cases which show definite evidence of changes in the ductless glands.

Diet in Cœliac Disease. In this condition the primary fault is an inability on the part of the child to utilise its fat. The fault does not lie in the splitting or digestion of the fats, which is carried out quite well, but the split fat is passed in large quantities in the stool The dried stool should normally contain about 25 per cent. of split fat, but in cœliac disease from 50 to 75 per cent is common.

The proper diet should be one low in fat, high in protein, which is well tolerated, and moderately high in carbohydrate Milk should be given as skimmed dried milk or well skimmed cow's milk or Horlick's Malted Milk, a total of ½ to ¾ pint of skimmed milk per day being the maximum. The yolk of egg is not well tolerated, since it is almost entirely fat and must be given with great caution. No cream, of course, should be given. Butter in scrapings only is tolerated, and in place of this fish pastes and scrapings of jam may be given. Skimmed condensed (evaporated) milk, spread on bread or biscuits, is both palatable and useful. Since all fats, and therefore the fat-soluble vitamins, have been removed, it is well to replace them by one of the concentrated ergosterol preparations (see p 138). One tablespoonful of orange juice and one teaspoonful of Marmite should be included in the diet daily As much liver extract as will lie on a sixpence should be given three times daily in the early stages. Four c.c. of Campolon (Bayer) given intramuscularly, per week, is indicated.

Such foods as scraped meat, lean crisp bacon, the white of egg, cold tongue, lean ham, underdone beef, are all most suitable, and should be introduced at two at least of the child's meals.

Groats, twice or thrice cooked rice, Plasmon prepara-

tions, are well tolerated A little potato only should be given and green vegetables in moderation Over ripe brown banana is extremely well tolerated and useful in certain cases In each case an attempt should be made to give banana in large quantities, as those in which it is tolerated progress rapidly

Cœliac Diet

(For children over the age of one year)

On Waking

A glass of orange juice grapefruit or tomato juice sweetened with sugar

Breakfast say 8 a m

Cereals such as porridge groats cream of wheat Force Farex puffed rice shredded wheat grapenuts served with a very little skimmed milk and well sweetened with sugar (See that the child's appetite is not satisfied with this course)

Second Course Two days in the week an egg (see note below) three or four days crisply fried very thin rashers of bacon (fried until the fat has been mainly removed, and then allowed to drip so that the minimum of grease remains) Fish should be given on one or two mornings, also lightly grilled liver Crisp toast and butter and one cupful only of well skimmed milk completes the meal

Mid morning

A plain biscuit or some fruit such as an orange or orange juice may be given.

Dinner say at 1° 30

Underdone beef steak stew cutlet chicken, fish or brains or occasionally a little lightly grilled liver potato cauliflower turnips parsnips carrots peas beans or green vegetables (including steamed lettuce) *all very well sieved* or Heinz, Libby's or Nestle's homogenised vegetables would be very suitable

Second Course Milk pudding and sieved stewed fruit or steamed pudding (without suet) or preferably *over ripe* banana if this is well tolerated (see note below)

Tea 4 30 to 6 p m.

Thin bread and butter crisp toast or pulled bread (zwieback) with sieved stewed fruit or a very little jam, treacle honey or golden syrup and a sponge cake Drinks the same as at breakfast *In winter* a bowl of broth or a little milk pudding may be given at this meal (Or over ripe banana may be given at this meal also if preferred)

Bedtime 6 30 to 7 p m

If the child has left some of his tea these remnants may be offered again at this time

Foods Well Tolerated

Scraped raw or underdone steak pounded chicken fish raw or lightly cooked liver and well-skimmed broth

Milk

A pint bottle of milk should be allowed to stand for two hours and the cream then poured or dipped off A skimmed dried or separated milk such as Cow and Gate may be given instead in equivalent quantities These children do best on from 12 to 20 oz of milk per day

Vegetables

These are best given very finely sieved. Avoid an excess of green vegetables, as they are bulky and tend to produce gas Potatoes, cauliflower parsnips, turnips and carrots are most suitable Heinz, Libby s or Nestle s homogenised vegetables are particularly suitable

Fruit

Over ripe bananas are often especially suitable but not tolerated in all cases Where they are well tolerated four or even six bananas should be given in the day Orange tomato or grapefruit juice should be given daily *All stewed fruit should be sieved*

Bread

This is best given as crisp toast or rusks and later as brown bread

Articles containing Fat which should be Avoided or Taken with Caution

Yolk of egg (give the white only at first) cream, butter fried foods Small doses of cod or halibut liver oil together with real or artificial sunlight will make up for the deficient vitamins

Diet in Catarrhal Jaundice The diet in this condition should be low in fat and high in sugar during the acute stage As carbohydrate throws no work on the liver, and both fat and protein do this, the latter two should be as far as possible avoided Well diluted skimmed milk (not more than ½ pint in the day) and a sufficient allowance of starchy foods at each of the three meals should be continued until the motions regain their brown colour

No attempt to push along with fats (cream) or proteins (meat other than a little tongue or bacon) should be made for some time No eggs or cream should be given and butter must be avoided for the time being Vegetable broth with crisp toast will be found most useful for dinner, and cereal foods, both cooked and dry, for breakfast and tea Stewed fruit may be served with these in place of milk or cream

Fever Diet (in Colds, Influenza, Tonsillitis, Bronchitis, Pneumonia and Infectious Diseases such as Measles, Scarlet Fever, etc) During a febrile illness in childhood

there is a tendency for acetone and diacetic acid to appear in the urine; the child is in a state of acidosis Such is responsible, to some extent, for the drowsiness and irritability of the patient. It results from the faulty burning up of the fat in the body, and the diet must therefore be planned to give the following:—

1. A minimum of fat (fats are found in butter, milk, cream and eggs).

2. A high proportion of carbohydrate (sugar, starch and glucose) in order to help the complete metabolism of fat.

3. Little or no protein foods (proteins are red and white meat, milk curd, egg white, etc.), so that the digestive and assimilative powers are not overtaxed.

The following suggestions may prove helpful in constructing a suitable diet in the presence of fever:—

1. *Times of Feeding.* The child is best fed at its regular feeding times, namely, breakfast, dinner, and tea-supper, with one feed in the night. Blond drinks, mentioned under 2, should be offered freely between feeds. Should the child be taking its food extremely badly, however, more frequent feedings may be necessary, but should on no account be pressed

2. *Fluids.* Water, barley water, orange or lemon water (well sweetened with sugar or glucose) should be given freely. Add a little bicarbonate of soda to any of these prepared fluids occasionally, and soda water might also be given.

3. *Sugar.* Try to get the child to take powdered glucose, two heaped teaspoonfuls three times daily, especially if there is a tendency to vomiting. This may be given dry or dissolved in fruit juice, or along with one of the starchy foods.

4. *Starches.* To increase the caloric value of the food, and at the same time prevent acidosis, the addition of starches and sugars is very useful. Patent groats or barley, made with water, Chapman's Entire Wheat Food, Cream of Rice, arrowroot, and cornflour, Benger's and Savory and Moore's Foods, are all to be recommended

is successfully employed in the treatment of eczema Dried Goat's Milk, manufactured by Cow and Gate is sold under the trade name of Caprolac Its composition is *protein* 27 1 per cent, lactose 47 2 per cent, fat 14 8 per cent, mineral matter 7 5 per cent, moisture 3·4 per cent Apart from these dietetic measures, it is essential that the child should be prevented from scratching by means of *cardboard arm splints*—the finger nails being clipped short The application of Calamine Lotion where the skin is dry, or Resorcin ointment where it is broken, is to be recommended

Urticaria (Heat Spots), Lichen Urticatus (Urticaria papulosa) The exact causation of this common skin condition is not known It would appear, however, that *heat induces attacks, and great care should be taken*, in hot weather especially, that children are not over clothed either by day or night Undoubtedly fat, such as bacon fat or dripping oils and fried food, will produce heat spots in some cases Acid fruits appear to cause attacks in other children All raw fruit should be stopped, such as oranges apples grapefruit, and stone fruit (excepting tangerines, which are not acid), until the spots have disappeared A teaspoonful of bicarbonate of soda, spread over the day (a pinch in all the drinks) is indicated The total diet is best reduced a little

Diet in Anæmia It is usually found that the diet of an anæmic child has been excessively high in starch and low in protein This should be corrected and the starchy foods decreased and the proteins increased The yolk of the egg contains much phosphorus and iron and an attempt should be made to give a little on three or four mornings in the week A little crisp lean bacon or fish at breakfast prevents this meal from being too starchy At midday scraped raw or underdone steak or mutton or lightly cooked liver should be given on four days in the week Vegetables, such as spinach or greens, especially when steamed rather than boiled have much available iron Raw meat juice may be given with Marmite at 11 a m, or poured over the midday meal as gravy

The most suitable forms of iron to be given medicinally to little children are Ferri Carb Sacch , as much as will lie on a sixpence three times daily after meals, or Parrish's Chemical Food, half a teaspoonful three times daily after meals, or iron and ammonium citrate,[1] 3 gr three times daily after meals Traces of copper and manganese have been shown to be essential for successful iron therapy Marmite should be given daily

Some of the proprietary liver extract preparations are extremely successful Among these are Allen and Hanbury's "Byno Hepol," "Neo Bovinine 20,' made by the Petrolagar Laboratories Ltd , "Hepa Simplex" (Benoard), and Livron (Boots), and other varieties of dried liver extract made by the large firms of manufacturing chemists Wander s "Veguva," a mixture of dried spinach, carrots and tomatoes, has a high iron content and is most suitable for anæmic infants and children Syrup Minadex (Glaxo) is a popular and useful tonic in anæmia

[1] Nutritional Anæmia in Infancy with special reference to Iron Deficiency Helen Mackay H s Majesty s Stationery Office 1931

APPENDIX I

SALINE SOLUTIONS

Normal saline is made by dissolving 1 drachm (a heaped teaspoonful) of salt in a pint of water and sterilising by boiling. It is used to replace fluid lost by the infant in cases of marked diarrhœa and in shock. It may be given *intravenously*, though this is a matter of extreme difficulty in infants or small children. The *subcutaneous route*, i.e., the injection of the saline into the subcutaneous tissues over the chest or abdomen, is the best method. The amount given (after the saline has been raised to the body temperature) will depend on the size of the patient, but is seldom more than 6 to 8 oz. at a time. Care must be taken not to over-distend the tissues, as in the debility which accompanies dehydration the skin over the site of injection has been known to slough when an attempt was made to give too much saline. Saline has been given *directly into the peritoneal cavity* by pinching up a fold of the lax abdominal wall and inserting a needle parallel to the surface. This method is certainly not devoid of the risk of infection and of puncturing the underlying gut.

Half-strength normal saline is made by dissolving ½ drachm (a level teaspoonful) of salt in a pint of water and sterilising as before by boiling. It is unsuitable for subcutaneous injection, but is of marked value when given by mouth. In cases of dehydration half-strength saline appears to be more readily retained by and absorbed from the infant's stomach. It may be freely given as a drink from time to time, or several ounces may be left in the stomach after gastric lavage.

Saline and Glucose. In giving subcutaneous or rectal salines, it is well to give glucose with it, as this acts not

only as food, but also combats accompanying acidosis The strength of glucose given with subcutaneous saline is from 2 to 5 per cent , and with rectal saline from 5 to 10 per cent

GASTRIC LAVAGE

Washing out the baby's stomach is often an essential for the treatment of cases of dyspepsia or vomiting, and is not a difficult matter The necessary apparatus consists of a soft, small, red rubber œsophageal tube, to the open end of which is attached a glass funnel The barrel of a 20 c c syringe may be used as a substitute for the latter There is no difficulty in passing the tube into the baby's stomach, and it is not necessary to use any lubricant if the outside of the tube has been wetted at the onset Water may be used or a solution of sodium bicarbonate (one teaspoonful to the pint) may be helpful if much mucus is present The liquid must be given warm, and care must be taken not to over-distend the infant's stomach by using more than a few ounces at a time By alternately raising the funnel above and then depressing it below the level of the infant, fluid may be run into or out of the stomach The lavage should be continued until the washings return clear, *i e* , unaccompanied by food *débris* or mucus, and, finally, if considered necessary, some fluid may be left in the stomach at the end of the operation If much *vomiting has occurred*, bicarbonate of soda should not be used, but normal saline only [1]

COLONIC LAVAGE

For washing out the rectum and lower few inches of the colon, an apparatus similar to that described for gastric lavage may be used Warm saline should be preferred to ordinary water The buttocks are raised on a pillow covered with mackintosh sheeting and the well greased tube gently inserted to a distance of 1 to 2 inches The level of the funnel should not be more than 18 inches above

[1] Mauzels M. McArthur C B , Payne W W "Alkalosis in the Pyloric Stenosis of Infants, *Lancet* February 8th 1930, p 286

phosphorus and iron, and in the fat soluble vitamins A and D The chief constituents of the egg are fat in the yolk and protein in the white, and the calorie value is about 70

Eggs should be cautiously introduced into the diet at breakfast, or occasionally at the midday feed from six months onward If there is any hesitation over taking the yolk of a soft boiled egg, minute quantities only should be added and a month should be taken to reach a quantity of a teaspoonful, or more if necessary Between the ages of six months and a year the yolks of two eggs may be given during the week From one year onward this may be increased to three eggs per week, when the child can tolerate so much

There are very few children below the age of nine or ten years who successfully tolerate more than three or four eggs in the week, numbers being slightly liverish because too many are given

Meats *Mutton and beef* are equally digestible, but *veal* is an immature meat and much more difficult to digest than either *Pork* is also indigestible, because of the fat between the fibres, taking half as long again to digest as beef or mutton *Bacon*, however, is very easy to digest, and *bacon fat is of* all fats the most digestible The more fat there is interspersed with the meat fibres, the more indigestible it is The most digestible of all meats is the breast of *chicken or game*

Kidney is very compact, and because of this is inclined to be indigestible It contains more nucleo proteins than ordinary meat, and is therefore inclined to be gouty *Sweetbreads* or pancreas are most digestible, but they also contain much nucleo protein and should not be given more than once per fortnight at most if there is *a familial gouty tendency Liver, fresh or dried, has been* shown to contain a substance which is most beneficial in the treatment of pernicious anæmia in adults and secondary anæmia in childhood It is well for fried ox or sheep's liver to be present in the diet of the child once per week It undoubtedly stimulates the appetites of

tolerated, *but, of course, they can be recognised in the stools* Spinach, sprouts or carrots cannot be mistaken in the light yellowish milky motion, but they should not be abandoned because of their presence in it

Vegetables vary in their *food value* Green vegetables have a high vitamin content, containing much water-soluble C and fat soluble A and D. Those containing much cellulose, such as beans, asparagus and turnips, may be given partly for their food value and partly as roughage, to promote peristalsis Among the vegetables richest in protein are the pulses (peas, beans and lentils), green vegetables, such as savoys, turnip tops, spinach and cauliflower. Those richest in carbohydrate are the pulses, savoys, turnip tops, tomatoes and cabbage, and tubers and root vegetables, such as potatoes, beetroots, carrots and parsnips

Vegetables are also valuable for their *salt content,* some of them having a high proportion of calcium, magnesium and sodium, which the body requires These salts (or mineral matter) are highest in the pulses, next highest in green vegetables, and a moderate proportion is to be found in the root vegetables or tubers Watercress, lettuce, tomato, cabbage and turnip are especially valuable for their vitamin content, as they contain much fat-soluble A and D and water soluble C

In *cooking vegetables* steaming is much to be preferred to boiling, as a large proportion of the carbohydrates, proteins and salts are wasted in the process of boiling By steaming with a small quantity of fluid only, this waste is almost completely eliminated Vegetables should only be cooked for sufficient time to make them thoroughly soft Steaming them with a little butter, or serving them with butter, adds to their taste and food value

Fruit and Fruit Juice There are several reasons why raw fruit or fruit juice is valuable in feeding all infants and children Besides the high vitamin content (see p 42), especially water soluble C, they are a means of providing carbohydrate in a pleasant form They also supply certain salts and water In some fruits there is

also a large amount of cellulose, and by virtue of this they tend to combat constipation.

Orange juice, tomato juice or grapefruit juice, two or three teaspoonfuls diluted with water and sweetened with sugar, should be commenced at once with all artificially-fed babies, irrespective of the fact that scurvy does not develop in children under six months of age. In breast-fed infants there is no need to start fruit juice before the age of three or four months. The kind of fruit juice given must be adjusted to the babies themselves. Orange juice is cheap and suits most infants, but occasionally it appears to be badly tolerated, and in these cases tomato juice or grapefruit juice must be substituted. In a constipated infant between six and nine months old a little strained stewed prune or stewed fig juice is permissible and useful. *Baked apple* or *apple sauce* can be given from nine months onward. After a year *prune pulp* and even *fig juice* containing some of the seeds are quite well tolerated.

WARNING. Some mothers or nurses discontinue the use of fruit juice when artificially feeding a child, because of a tendency to looseness in the bowels. It must be remembered that fruit juice is given for its vitamin content, and although it may be necessary to discontinue its use for a day or two, it must be recommenced or scurvy will result.

Raw apple produces looseness in the majority of children under two years, and should therefore be given with great care. There is no very great advantage in giving the apple raw, and on that account it would seem unnecessary to insist on it. *Bananas* contain a high proportion of carbohydrate and banana oil. The over-ripe, brown or black banana is most suitable for infant feeding, and in such conditions as cœliac disease bananas are well tolerated. The average child tolerates only small quantities at long intervals, say *half a banana well mashed up* at tea time once a week, to be commenced between one and two years. *Grapefruit and orange,* including the pulp, can be given with safety from two years of age. *Peaches and apricots* contain little nourishment, but can be given

stewed quite safely after the age of one year and raw after two years. *Pears* must rank among the more indigestible fruit, and should not be given raw or stewed before the first dentition is complete at about two and a half years of age. Seed fruit, such as *strawberries and raspberries*, are much better given cooked, and then not before the age of two years.

Raw fruit may be given to very young children with care and in moderation with advantage, but in large quantities and without discrimination it can do a great deal of *harm*. *Many mothers too readily exploit the idea* that fruit is good for children, and give in to their demands by heaping fruit upon them Excessive raw fruit, besides producing looseness, is conducive to the production of urticarial and other rashes (see p 150). There is some evidence that this is due to the acidity of the fruit. Both apples and bananas contain much acid and tend to produce urticaria in some children.

Tangerines, which are bland and non-acid, will readily take the place of oranges as a source of vitamin in those children who show an intolerance for acid fruit.

Melons cannot be said to be a suitable food for infants or young children, and are among the most indigestible of all raw fruits. The giving of melon at any age should be considered an experiment, and its effect carefully watched.

Cereals (see p. 53). *A very large proportion of the diet of the human infant and child is made up of starchy* food. It may be given in a great many appetising forms. On page 160 is a table quoted from Sherman,[1] showing the quantities of carbohydrate, protein and fat in some of the more common cereals.

Mellanby[2] has shown that the form of starchy food given to a puppy matters profoundly. Oat flour is much more rickets-producing than wheat flour for some yet undetermined reason. Clinically, it has been noted for

[1] Sherman, "Food Products" New York: Macmillan, 1920

[2] Mellanby, E.: *Med Research Council Report*, No 93, "Experimental Rickets"

	Per cent. Carbohydrate	Per cent. Protein	Per cent Fat.
Oatmeal . .	67·5	16·1	7·2
Rice . . .	79 0	8·0	0 3
Wholemeal flour .	71·9	13 8	1·9
White flour . .	76·4	7·9	1·4
Barley . .	77·8	8 5	1·1
Rye . . .	76·7	6 8	0 9

many years that a diet with an excessive proportion of starch in it tends to produce rickets. That the "balance" of a diet is of importance there is no manner of doubt. Wheat flour is least productive of rickets, rice flour, wholemeal flour and barley flour come next in that order, and oat flour is the cereal most productive of rickets. Provided that cereals are accompanied by a sufficient quantity of milk (in the average child from six months to two years this is about 1 pint per day), and the child is having some anti-rachitic vitamin in the form of cod-liver oil, starches can be given with perfect safety in reasonable quantities.

Some of the cereals in common use are porridge, Cream of Wheat, groats or Wheatena, the dried cereals, such as Shredded Wheat or Grape-nuts, bread and toast, rusks and pulled bread (Zwieback), Ryvita crispbread, ground rice, tapioca, sago, macaroni, spaghetti and vermicelli. The patent cereals will be found on p. 53. The value of cereals depends not only on their carbohydrate content, but also on their vitamin, salt and protein content. One of our chief sources of vitamin B is to be found in cereal foods. Polished rice is, however, lacking in this respect.

Digestibility. The starch grains of different cereals vary in their digestibility, some requiring much more cooking than others to split them open. Some contain more cellulose and have more residue on account of this. The great majority absorb a quantity of water during cooking and swell to three or more times their original

size For example, a teaspoonful of groats makes half a teacupful of porridge.

Wholemeal flour produces bread containing more vitamin B than white flour, but, on the other hand, because of its cellulose content, much less of the wholemeal bread is absorbed than bread made from white flour This fact is taken advantage of where a residue is required in the intestine to combat constipation

Cooking Cereals It is almost impossible to imagine an over cooked cereal food The common mistake is to under cook it, and the starch granules are offered to the child unsplit, so that indigestion results Half an hour's direct cooking, or from one to two hours in a double saucepan, is most desirable

Cream of Rice Take one heaped teaspoonful of Groult's "Crème de Riz" (cream of rice agents, Lazenby & Co), mix to a paste with cold water, add a teacupful of milk, place in a double saucepan, and simmer for forty minutes to one hour, stirring frequently This should produce about half a teacupful of a consistency suitable to be spoon fed to the infant

Groats Robinson's Patent Groats for breakfast

Take a heaped teaspoonful of groats, mix to a paste with cold water and add a teacupful of warm water to this. Place in a double saucepan Boil for from thirty minutes to one hour Stirring will prevent lumps forming After mixing with cold water and before cooking this may be added to the infant's bottle of milk and cooked with it, thus sterilising the milk at the same time As a rule, however, it is more convenient to feed the semi-fluid groats and milk with a spoon

Cream of Wheat Bring a pint of water or milk and water to the boil in a small double saucepan To this add two level tablespoonfuls of cream of wheat and stir till the porridge thickens Then allow this to cook for at least an hour This amount of cream of wheat is sufficient for three or four children for one meal

Ice Cream In certain febrile illnesses plain ice cream will be found most useful For example, in typhoid

fever, when the temperature is very high, plain water ices help to reduce this temperature, and at the same time add a little carbohydrate to the day's food, thus combating acidosis Ice cream itself containing creamy milk and yolk of egg is more nourishing and has a much higher fat content In making this, therefore, the egg yolk should be reduced to a minimum and the milk should be well skimmed In this form it is extremely palatable and useful after tonsillectomy

Broadly speaking ices may be divided into two classes, cream ices and water ices The former are sometimes composed almost entirely of cream sweetened, flavoured and elaborated in a number of ways, but more frequently the so called cream ice consists of custard, more or less rich according to respective requirements, with the addition of flavouring ingredients (Mrs Beeton)

Water ices are usually prepared from the juice of fresh fruit, mixed with fruit syrups or jam

A simple recipe is the following —

Lemon Milk. One quart of milk, two cups of sugar and half a cup of lemon or orange juice Allow to freeze in an ordinary freezer, or Frigidaire

Where fat is tolerated the following is an excellent ice one cup of milk, half a cup of cream, half a cup of sugar, one egg salt and Vanilla to taste Allow to freeze

Principal Food Sources of the Vitamins [1]

VITAMIN A

xxx Escarole (a green leafy vegetable), spinach, Alfalfa. Carrots
Animal fats and oils glandular organs, eggs, milk
Butter Cod halibut and other fish liver oils

xx Artichoke green string beans brussels sprouts celery leaves lettuce, green peas
Pumpkin sweet potatoes green dried peas.
Tomato, banana, date dried prune water melon (raw and tinned)

[1] Taken from The Vitamins Sherman and Smith, 2nd Ed., 1931 Macmillan New York

x Cabbage, cauliflower, cucumber
Turnip, beet, lentil, onion, parsnip
Fresh apples, cooking figs, fresh grapes, orange juice, grapefruit, lemons, peaches
Barley, bran, commercial bread, cottonseed
Nuts almonds, Barcelona nuts, Brazil nuts, walnuts and peanuts Seed oils
Animal muscle tissues

VITAMIN B_1

xxx Yeast, cereals (particularly wheat germ), beans, peas and seeds, spinach, kale, mustard greens Tomato
Milk, eggs, nuts Asparagus (green)
xx Heart, liver and kidney Hog muscle
Wheat (whole), rye, barley, oatmeal, maize, brown rice
Potatoes carrots, turnips
Oranges, lemons grapefruit, fresh prunes, apples and pears, bananas
x Meats (ordinary)
Milled wheat, maize, rice

VITAMIN B_2

xxx. Cereal products, yeast, milk, lean meat, green leaves Liver
xx Tomatoes, eggs milk, fish
x Maize, butter

VITAMIN C

xxx Lemon juice, orange juice, tomato juice (fresh or tinned), swedes turnip, spinach, watercress
xx Lime juice raspberries and cloudberries fresh cherries fresh apples, carrots, potatoes, onions cabbage germinated seeds, watermelon
x Grape juice, pears, apricots, peaches, plums Raw milk

VITAMIN D

xxx Fish liver oil (goose fish liver, herring, sardine oil and cod and halibut liver oil) Puffer fish liver oil
Egg yolk, butterfat, whole milk
xx Green leafy foods

VITAMIN E

xxx Lettuce leaves, wheat embryo
xx Seed oils and vegetable oils.
x Bananas and oranges Animal tissues.

MEALS FOR ONE DAY FOR A CHILD OF ABOUT THREE YEARS (WEIGHT 31 TO 35 LB.)

MONDAY

	Ounces.	Protein in Calories	Fat in Calories.	Carbohydrate in Calories.	Total Calories.	Phosphorus in Grammes.	Iron in Milligrammes	Calcium in Grammes.	Vitamins.
On Waking									
Grapefruit juice, 2 tablespoonfuls	1	—	—	14	14	005	·067	·006	A, B, C.
Sugar two lumps	½	—	—	41	41	—	—	—	—
Breakfast 8 a m									
Wheatena, cooked with 4 oz of milk two tablespoonfuls	3	29	56	70	155	133	·520	167	*A* B, C, D
Sugar, one teaspoonful	⅓	—	—	30	30	—	—	—	—
Bacon, two crisp rashers	1	14	93	—	107	037	525	·002	A B, D
Toast two half slices	1	16	—	90	106	035	350	·011	B
Butter	½	—	93	—	93	·002	·027	·002	A, D
Milk to drink	4	17	37	22	76	·109	26?	190	A, B, C, D.
Dinner 12.30 p m									
Irish stew with potato, two tablespoonfuls	4	74	128	131	333	231	3 600	·071	A, B, C, D
Baked custard, one tablespoonful	2	12	32	46	90	·090	533	·021	A, D, C, D
Baked apple, one tablespoonful	2	—	—	61	61	·005	102	·007	A, B, C.
Tea-supper 4 30 to 5 p m									
Brown bread, three half slices	3	57	—	164	221	130	2 850	123	A, B
Butter	½	—	93	—	93	·002	·027	·002	A, D
Jelly, two teaspoonfuls	½	—	—	41	41	·020	·5?2	·023	—
One sponge cake	1	11	11	46	·017	175	·005	R.	
Milk to drink	6	33	75	45	163	201	525	261	A, B, C, D
Total		232	607	821	1,660	1·001	10 265	·878	

TUESDAY

	Ounces.	Protein in Calories	Fat in Calories	Carbohydrate in Calories	Total Calories.	Phosphorus in Grammes	Iron in Milligrammes	Calcium in Grammes.	Vitamins.
On Waking									
Orange juice 2 tablespoonfuls	1	—	—	14	14	·006	069	010	A B, C.
Sugar two lumps	½	—	—	41	41	—	—	—	—
Breakfast 8 a m									
Porridge, two tablespoonfuls	3	8	19	41	68	·069	672	·012	A, D.
Sugar, one teaspoonful	⅓	—	—	30	30	—	—	—	—
An egg	1	25	50	—	75	092	1 837	·034	A, B, D
Brown bread, two half slices	2	125	—	123	148	052	525	018	A, B
Butter	½	—	93	—	93	·002	027	·002	A, D
Milk, including that given with the porridge	10	41	93	57	191	255	665	331	A, B, C, D
Dinner 12.30 p m.									
Roast mutton, one tablespoonful	2	91	19	—	80	162	2 200	009	A, B, D
Spinach, one tablespoonful	2	6	—	10	15	·042	2 250	·042	A, B, C, D
Mashed potatoes, 1 tablespoonful	2	12	—	84	68	·045	1·050	·011	A, B, C.
Fruit salad with syrup, one heaped tablespoonful	2	2	—	101	103	·012	·234	·012	A, B, C.
Tea supper 4.30 to 5 p m.									
Bread two half slices	2	25	—	123	148	·052	5?5	·014	A, B.
Zwieback, one piece		3	—	23	26	·010	105	·003	A, B
Butter	½	—	93	—	93	·002	027	·002	A, D
Honey, two teaspoonfuls	½	—	—	49	49	·003	·150	·001	B.
Biscuits	1	11	—	46	45	·017	·175	·005	B
Milk to drink	10	41	93	57	191	·255	·665	·331	A, B, C, D
Total		268	460	769	1,477	1·079	10·033	0·827	

WEDNESDAY

	Ounces.	Protein in Calories.	Fat in Calories.	Carbohydrate in Calories.	Total Calories.	Phosphorus in Grammes.	Iron in Milligrammes.	Calcium in Grammes.	Vitamins.
On Waking									
Tomato juice, two tablespoonfuls	1	—	—	14	14	·162	·262	·075	A, B, C
Sugar, two lumps	½	—	—	41	41	—	—	—	—
Breakfast 8 a m									
Force, two tablespoonfuls	½	18	2	20	22	—	—	—	—
Sugar one teaspoonful	½	—	—	30	30	—	—	—	—
Haddock, one tablespoonful	1	41	—	—	41	·060	830	·065	A, B, D
Toast two half slices	1	16	1	90	104	·038	350	·011	B
Butter	—	—	93	—	93	·002	·027	·002	A, D
Milk, including that given with Force	10	41	93	57	191	255	·665	331	A, B, C D
Dinner 12.30 p m									
Liver, one piece	1½	41	37	8	86	481	6·000	·023	A, B C D
Bacon two crisp rashers	½	14	93	—	107	·037	525	·002	A, B D
Mashed potatoes, 1 tablespoonful	2	12	—	54	66	·049	1·050	·011	A, B C
Carrots one tablespoonful	1½	1	—	8	8	·010	133	012	A, B C, D
Stewed apples, two tablespoonfuls	3	—	—	25	25	·003	·075	·002	A, B C
Sugar two teaspoonfuls	½	—	—	60	60	—	—	—	—
Tea-supper 4 30 to 5 p m.									
Brown bread, three half slices	3	37	1	184	221	180	2 860	123	A, B
Butter	—	—	93	—	93	·002	·027	·002	A, D
Jam, two teaspoonfuls	½	—	—	41	41	·020	·575	·028	—
One sponge cake	½	4	2	40	46	·017	175	·005	B
Milk to drink	10	41	93	57	191	·255	·665	331	A, B, C, D
Total		243	502	735	1,482	1 533	13 716	1·023	

THURSDAY

	Ounces.	Protein in Calories.	Fat in Calories.	Carbohydrate in Calories.	Total Calories.	Phosphorus in Grammes.	Iron in Milligrammes.	Calcium in Grammes.	Vitamins.
On Waking									
Grapefruit juice, 2 tablespoonfuls	1	—	—	14	14	·003	·08"	·006	A B C.
Sugar two lumps	½	—	—	41	41	—	—	—	—
Breakfast 8 a m									
Porridge, two tablespoonfuls	3	8	19	41	68	·060	·675	·012	A, B
Sugar, one teaspoonful	½	—	—	30	30	—	—	—	—
An egg	2	35	50	—	75	·092	1·537	034	A, B, D
Bread, two half slices	2	25	1	123	149	·052	525	·016	B
Butter	½	—	93	—	93	·002	·027	002	A, D
Milk including that given with the porridge	6	33	75	45	153	201	625	201	A, B, C, D
Dinner 12.30 p m									
Chicken, one tablespoonful	2	62	41	—	103	162	2 250	·009	A, B, D
Mashed potatoes, one tablespoonful	2	12	—	54	66	·049	1·050	·011	A, B, C
Greens one tablespoonful	½	2	—	8	10	·009	349	·014	A, B, C, D
Cream of rice, one tablespoonful	2	24	55	125	204	135	045	160	A, B, C, D
Maple syrup or jam, 2 teaspoonfuls	½	—	—	41	41	·020	·675	·028	—
Tea-supper 4 30 to 5 p m									
Brown bread three half slices	3	37	1	184	221	180	2 860	123	A, B
Butter	½	—	93	—	93	002	·027	·002	A, D
Half a banana	1	4	1	25	25	·008	040	·002	A, B, C
One sponge cake	½	4	2	40	46	·017	175	·005	B
Milk to drink	6	33	75	45	153	201	625	·201	A, B C D
Total		261	501	822	1,584	1 203	11 806	·916	

N B.—Rabbit may be substituted for chicken

MEALS FOR ONE DAY FOR A CHILD OF ABOUT THREE YEARS (WEIGHT 31 TO 35 LB.)

MONDAY

	Ounces	Protein in Calories	Fat in Calories	Carbohydrate in Calories	Total Calories	Phosphorus in Grammes	Iron in Milligrammes	Calcium in Grammes	Vitamins
On Waking									
Grapefruit juice 2 tablespoonfuls	1	—	—	14	14	005	·06	·006	A B C.
Sugar two lumps	½	—	—	41	41	—	—	—	—
Breakfast 8 a.m.									
Wheatena, cooked with 4 oz. of milk two tablespoonfuls	3	29	36	70	135	133	630	18	A B, C, D
Sugar one teaspoonful	½	—	—	20	20	—	—	—	—
Bacon two crisp rashers	½	14	91	—	107	·037	5·5	·007	A B D
Toast two half slices	1½	18	—	90	106	·035	350	·011	B.
Butter	½	—	93	—	93	·007	·07	·007	A D
Milk to drink	4	17	37	—	6	100	·6	180	A B C D.
Dinner 12.30 p.m.									
Irish stew with potato, two tablespoonfuls	4	4	123	101	823	231	3 600	·071	A B C D
Baked custard, one tablespoonful	1	1	3	46	90	·000	533	·021	A B, C D
Baked apple one tablespoonful	2	—	—	61	61	·008	19	·007	A, B, C
Tea-supper 4.30 to 5 p.m.									
Brown bread three half slices	3	57	—	184	271	180	860	123	A B,
Butter	½	—	93	—	93	·007	07	·002	A D
Jelly two teaspoonfuls	½	—	—	41	41	·070	57	·004	—
One sponge cake	½	—	—	46	46	·017	175	·005	B.
Milk to drink	6	25	75	45	145	·101	·425	·281	A B C D
Total		234	607	871	1 660	1·061	10·763	6·6	

TUESDAY

	Ounces.	Protein in Calories.	Fat in Calories	Carbohydrate in Calories	Total Calories.	Phosphorus in Grammes	Iron in Milligrammes	Calcium in Grammes	Vitamins.
On Waking									
Orange juice 2 tablespoonfuls	1	—	—	14	14	·006	·060	·010	A B, C.
Sugar two lumps	½	—	—	41	41	—	—	—	—
Breakfast. 8 a.m.									
Porridge, two tablespoonfuls	3	8	19	41	68	·002	·6	·01	A B
Sugar one teaspoonful	½	—	—	20	20	—	—	—	—
An egg	2	25	50	—	75	·097	1 527	·037	A B, D
Brown bread two half slices	1½	25	—	121	146	·05	5 5	·014	A B.
Butter	½	—	93	—	93	·007	·027	·007	A, D
Milk in luding that given with the porridge	10	41	93	57	191	2·3	·665	331	A B C D
Dinner 12.30 p.m.									
Roast mutton, one tablespoonful	1	61	15	—	80	15	2·0	·002	A B D
Spinach, one tablespoonful	2	8	—	10	15	·012	·251	·012	A B C D
Mashed potatoes 1 tablespoonful	2	1	—	54	68	·019	1·0	·011	A B C.
Fruit salad with syrup one heaped tablespoonful	4	1	—	101	102	·012	234	·01	A, B C.
Tea-supper 4.30 to 5 p.m.									
Bread two half slices	2	25	—	118	143	·052	8·5	·014	A B
Treacle one piece	½	3	—	22	24	·010	105	·003	A B.
Butter	½	—	93	—	93	·002	·07	·0	A D
Honey two teaspoonfuls	½	—	—	69	69	·003	150	·001	I
Biscuit 2	½	—	—	46	46	·017	1 5	·005	B.
Milk to drink	10	41	91	57	191	2·3	·665	331	A B, C, D.
Total		245	460	789	1 477	1·077	10·085	0·827	

WEDNESDAY

	Ounces	Protein in Calories	Fat in Calories	Carbohydrate in Calories	Total Calories	Phosphorus in Grammes	Iron in Milligrammes	Calcium in Grammes	Vitamins
On Waking									
Tomato juice, two tablespoonfuls	1	—	—	14	14	163	·6*	·075	A B C.
Sugar two lumps	½	—	—	41	41	—	—	—	—
Breakfast. 8 a m									
Force two tablespoonfuls									
Sugar one teaspoonful				30	30				
Had lock one tablespoonful	1	41	—	—	41	·049	330	·005	A B D
Toast two half slices	1	16	—	90	106	·035	3·0	·011	B
Butter		—	93	—	93	·00*	·0*7	·002	A D
Milk including that given with Force	10	41	93	57	191	255	·665	331	A B C D
Dinner 12.30 p m.									
Liver one piece	1½	41	37	8	86	431	6 000	·023	A I C D
Bacon two or three rashers	½	14	93	—	10*	037	52.	·002	A B D
Mashed potatoes 1 tablespoonful	2	1*	—	54	66	·043	1·050	011	A B C.
Carrots one tablespoonful	1½	—	—	8	8	·010	133	·01*	A I C, D
Stewed apples two tablespoonfuls	3	—	—	25	25	·003	·0 5	·00*	A B C.
Sugar two teaspoonfuls	½	—	—	60	60	—	—	—	—
Tea supper 4.30 to 5 p m									
Brown bread three half slices	3	3*	—	154	***1	180	2·660	1*3	A B
Butter		—	93	—	93	·002	·0*7	·00	A D
Jam two teaspoonfuls		—	—	41	41	·0*0	57*	·028	—
One sponge cake		—	—	46	46	·017	175	·005	B
Milk to drink	10	41	93	5*	191	·255	·665	331	A B C D
Total		245	50*	735	1 482	1 533	13 716	1·023	

THURSDAY

	Ounces.	Protein in Calories.	Fat in Calories.	Carbohydrate in Calories	Total Calories	Phosphorus in Grammes	Iron in Milligrammes	Calcium in Grammes	Vitamins
On Waking									
Grapefruit juice 2 tablespoonfuls	1	—	—	14	14	·005	·087	·006	A B C
Sugar, two lumps	½	—	—	41	41	—	—	—	—
Breakfast 8 a m									
Porridge, two tablespoonfuls	3	8	19	41	69	·069	67*	·012	A, B
Sugar one teaspoonful	½	—	—	30	30	—	—	—	—
An egg	2	35	50	—	85	·09*	1 527	034	A B D
Bread two half slices	2	25	—	1*3	143	·032	52.	·016	B
Butter	½	—	93	—	93	·00*	·0*7	·00*	A D
Milk including that given with porridge	5	33	*5	45	153	·201	·525	·261	A B C, D
Dinner 1 30 p m*									
Chicken, one tablespoonful	*	6*	41	—	103	162	2 250	·009	A B D
Mashed potatoes one tablespoonful	*	1*	—	54	68	·043	1·0.0	011	A B C.
Greens, one tablespoonful	2	2	—	8	10	·009	349	·014	A B C D
Cream of rice one tablespoonful	2	24	53	125	204	135	·045	160	A B C D
Maple syrup or jam 2 teaspoonfuls	½	—	—	41	41	·020	5**	·028	—
Tea-supper 4.30 to 5 p m.									
Brown bread three half slices	3	3*	—	154	***1	180	2 660	1*3	A B
Butter	½	—	93	—	93	·002	·0*7	·00*	A D
Half a banana	1	—	—	25	25	·008	·080	·00*	A B C
One sponge cake	½	—	—	46	46	·017	1 5	·005	B.
Milk to drink	6	33	75	45	153	·201	·525	·261	A B C D
Total		*61	301	822	1,284	1·293	11 206	·946	

N B.—Hash it may be substituted for chicken.

FRIDAY

	Ounces	Protein in Calories.	Fat in Calories.	Carbohydrate in Calories	Total Calories	Phosphorus in Grammes	Iron in Milligrammes	Calcium in Grammes	Vitamins.
On Waking									
Prune juice two table spoonfuls	1	—	—	14	14	·005	140	·00"	A B C
Sugar two lumps	½	—	—	41	41	—	—	—	—
Breakfast 8 a m									
Cream of wheat cooked with 6 oz of milk, two tablespoonfuls	3	36	49	t54	230	167	630	157	A, B C, D
Sugar one teaspoonful	⅓	—	—	30	30	—	—	—	—
Bacon two crisp rashers	1½	14	93	—	107	03	5"5	00"	A B D
Toast two half slices	1	16	—	90	106	·035	350	·011	B
Butter	½	—	93	—	93	·00"	·0"7	·00'	A D
Milk to drink	6	29	46	"9	95	1 7	33"	165	A, B C, D
Dinner 1" 30 p m									
Baked fish one tablespoonful	1½	61	77	18	146	138	660	130	A B D
One baked potato	3	19	*	8	101	·069	1 560	·016	A, B C.
One baked tomato	*	*	*	10	14	169	0	075	A B, C,
Apple Charlotte one tablespoonful	*	6	39	104	149	·014	198	·006	A B C, D.
Tea supper 4 30 to 5 p m.									
Toast three half slices	2½	"4	—	135	159	·0>"	5"5	·016	B
Butter	½	—	93	—	93	·00"	·0 7	00'	A D
One sponge cake	1½	—	—	46	46	·017	173	005	B.
Milk to drink	10	41	93	57	101	255	·066	331	A B C, D
Total		"·0	·83	810	1 9"4	1 080	6·0 6	·9"0	

SATURDAY

	Ounces	Protein in Calories	Fat in Calories	Carbohydrate in Calories	Total Calories.	Phosphorus in Grammes.	Iron in Milligrammes	Calcium in Grammes.	Vitamins.
On Waking									
Tomato juice two table spoonfuls	1	—	—	14	14	169	"82	·076	A B C
Sugar two lumps	½	—	—	41	41	—	—	—	—
Breakfast 8 a m									
Force two tablespoonfuls	½	*	—	"0	"*	—	—	—	—
Sugar one teaspoonful	⅓	—	—	30	"0	—	—	—	—
An egg	1½	25	60	—	5	·09"	1 537	·034	A B D
Bread two half slices	*	25	—	1"3	146	0 *	5"5	·016	B.
Butter	½	—	93	—	93	·00"	·0"7	00'	A D
Milk including that given with Force	10	41	93	57	191	"55	66.	331	A B C D
Dinner 12.30 p m									
Scotch broth, two tablespoonfuls	"	54	23	46	1"5	·053	3 615	·054	A B C, D
Mashed potatoes one tablespoonful	2	12	—	54	66	·043	1·050	·011	A B C.
Ca tle pudding with jam	1½	11	410	123	"53	042	541	·0.8	A B D
Tea supper 4.30 to 5 p m									
Brown bread three half slices	3	37	—	134	521	180	* 860	123	A B
Butter	½	—	93	—	93	·00"	·0"7	·00'	A D
Honey two teaspoonfuls	½	—	—	42	42	·002	150	·001	B
Sponge cake	1½	—	—	46	46	·017	173	·005	B
Milk to drink	10	41	93	57	191	255	·665	131	A B C, D
Total		"·3	666	844	1 6.5	1 177	12 209	1·012	

SUNDAY

	Ounces.	Protein in Calories.	Fat in Calories	Carbohydrate in Calories.	Total Calories	Phosphorus in Grammes.	Iron in Milligrammes.	Calcium in Grammes	Vitamins.
On Waking									
Orange juice, two tablespoonfuls	1	—	—	14	14	·006	·069	010	A B, C.
Sugar two lumps	½	—	—	41	41	—	—	—	—
Breakfast 8 a m									
Porridge two tablespoonfuls	3	8	19	41	68	069	672	·012	A, B
Sugar, one teaspoonful	½	—	—	30	30	—	—	—	—
Plaice one tablespoonful	1½	25	4	—	29	069	330	065	A, B, D
Toast two half slices	1	16	1	90	106	·075	350	011	B
Butter	½	—	93	—	93	002	·027	002	A, D
Milk, including that given with the porridge	8	33	75	45	153	201	525	261	A, B, C, D
Dinner 12.30 p m.									
Roast beef one tablespoonful	2	62	50	—	115	182	2 250	009	A, B, D
Potato, one tablespoonful	3	19	—	82	101	060	1 560	016	A, B, C
Cabbage, one tablespoonful	2	2	—	8	10	009	340	014	A, B, C, D
Rice pudding one tablespoonful	1½	24	55	125	204	135	045	160	A, B, C, D
Tea-supper 4 30 to 5 p m									
Brown bread, three half slices	3	37	—	184	221	180	2 860	·123	A, B
Butter	½	—	93	—	93	·002	027	·002	A, D
Jam, two teaspoonfuls	½	—	—	41	41	·020	5·72	·028	—
One sponge cake	½	—	—	46	46	017	175	·005	B
Milk to drink	8	33	75	45	153	·201	525	·261	A, B C D
Total		259	470	792	1 521	1 177	10·336	979	

THE ENERGY REQUIREMENT AT THE DIFFERENT AGES (SHERMAN) [1]

Under 1 year	100 Calories per kilo	(45 calories per lb.)	
1– 2 years	100–90 „ „	45–40 „	„
2– 5 „	90–80 „ „	40–36 „	„
6– 9 „	80–70 „ „	36–32 „	„
10–13 „	75–65 „ „	34–30 „	„
14–17 „	65–50 „ „	30–23 „	„
18–25 „	55–40 „ „	25–18 „	„

ALLOWANCES IN CALORIES PER DAY AT DIFFERENT AGES (SHERMAN) [1]

Children of 1–2 years	1,000–1,200	Calories per day
Children of 2–5 „	1,200–1,500	„ „
Children of 6–9 „	1,400–2,000	„ „
Girls of 10–13 „	1,800–2,400	„ „
Boys of 10–13 „	2,300–3,000	„ „
Girls of 14–17 „	2,200–2,600	„ „
Boys of 14–17 „	2,800–4,000	„ „

[1] From "The Chemistry of Food and Nutrition," Henry C. Sherman Macmillan (New York), 3rd Ed., 1928.

FOOD ALLOWANCES FOR HEALTHY CHILDREN (GILLETT)

Age	Calories per Day	
Years	Boys	Girls
Under 2	900–1,200	900–1,200
2–3	1,000–1,300	080–1 280
3–4	1,100–1,400	1 060–1,360
4–5	1,200–1,500	1,140–1,440
5–6	1,300–1,600	1,220–1,520
6–7	1,400–1,700	1 300–1,600
7–8	1,500–1,800	1 380–1,680
8–9	1 600–1,900	1 460–1,760
9–10	1,700–2 000	1 550–1 850
10–11	1,900–2 200	1,650–1 050
11–12	2,100–2 400	1,750–2 050
12–13	2,300–2,700	1 850–2,150
13–14	2 500–2 000	1 050–2 250
14–15	2,600–3,100	2,050–2 350
15–16	2,700–3,300	2,150–2 450
16–17	2 800–4 000	2,250–2,600

TABLE SHOWING WEIGHT, HEIGHT, AND CIRCUMFERENCE OF THE HEAD AND CHEST FROM BIRTH TO THE SIXTEENTH YEAR (HOLT)

Age	Weight in Pounds		Height in Inches		Circumference of Chest in Inches		Circumference of Head in Inches	
	Boys	Girls	Boys	Girls	Boys	Girls	Boys	Girls
Birth	7 5½	7 1½	20·6	20·6	13 4	13 0	13 9	13 5
6 months	16 0	15 8	25 4	25 0	16 5	16·1	17·0	16 6
12 "	20 5	19 8	29 0	28 7	18 0	17 4	18 0	17 6
18 "	23 8	23 0	30·0	29 7	18 5	18·0	18 5	18·0
2 years	26 5	25 5	32 5	31 5	19·0	18 6	18·9	18 8
3 "	31 2	30 0	35 0	35 0	20·1	19·8	19 3	19 0
4 "	35 0	34 0	38 0	38 0	20 7	20·5	19 7	19 5
5 "	41 2	39 8	41 7	41 4	21 6	21 0	20 5	20·2
6 "	45 1	43 8	44 1	43 8	23 2	22 8	—	—
7 "	49 5	46 0	46 2	45·0	23 7	23 3	—	—
8 "	54 4	50 9	48 2	48 0	24 4	23 8	—	—
9 "	60 0	6 5	50 1	48 6	25 1	24 5	—	—
10 "	66 8	64 1	52 2	51 8	25 8	24 7	21 0	20·7
11 "	7 4	70 3	64 0	53 8	26 4	25 3	—	—
12 "	79 8	81 4	65 8	57 1	27 0	26 8	—	—
13 "	88 3	91 2	58 *	53 7	27 7	28 0	—	—
14 "	99 3	100·3	61 0	59·3	28 8	29 2	—	—
15 "	110·8	109·4	63 3	61 4	30·0	30 3	21·8	21 5
16 "	123 7	113 0	65 0	61 7	31 2	30·8	—	—

Pulse Rate.		Respiration Rate	
At birth	140–1*0	At birth	50–32
6 to 12 months	115–105	First year	35–25
2 to 6 years	105–90	2 to 4 years	25
11 to 14 years	85–75	5 to 14 years	25–20

Pulse-respiration ratio = 1 5½ or 4

EXAMINATION PAPERS

APPENDIX II

INFANT CARE IN HEALTH AND DISEASE AND MEDICAL AND SURGICAL DISEASES OF CHILDREN

THE GENERAL NURSING COUNCIL FOR ENGLAND AND WALES

Final State Examination for the Supplementary Part of the Register for Sick Children's Nurses

WEDNESDAY, OCTOBER 14TH, 1936

Infant Care in Health and Disease, and Medical Diseases of Children

(First Paper)

MORNING

(Three Questions in all are to be Answered Questions 1 and 2 are Compulsory Time allowed—One and a half hours)

1 A breast fed baby gains weight rapidly, has much flatulence and frequent large green stools State what is likely to be the cause of this condition and give your management of such a case

2 Give the common causes of constipation in an infant and state what you as a nurse might do to remedy this

3 State what you understand by (*a*) night terrors (*b*) habit spasm What would your management be of the child in each case?

4 Say what types of meningitis you know Describe the course of one type

Surgical Diseases of Children

(Second Paper)

1 What are the principles of the treatment of a fracture of the thigh? Describe briefly how this condition would be dealt with in a child of ten years

2 A child is brought to Casualty with history of bleeding from the anus What conditions are likely to cause this?

3 What are the three varieties of wounds and the particular dangers associated with each?

4 State briefly what you understand by—
(*a*) Ecchymosis,
(*b*) Collapse,
(*c*) Embolus,
(*d*) Hydrocele,
(*e*) Septicæmia

AFTERNOON

General Nursing of Sick Children

1 Mention the chief points to be observed in nursing a child with acute endocarditis giving reasons for the treatment that you would adopt

2 What would be your immediate nursing treatment of a severe scald of the chest in a young child? What complications, immediate and remote are likely to occur?

3 Give the nursing care of a child suffering from mucopurulent conjunctivitis What precautions must be taken in his treatment?

4 What do you understand by normal saline solution? How would you prepare it in a private house? Describe the various methods by which it may be given to a patient

WEDNESDAY, FEBRUARY 3RD, 1937

Infant Care and Medical Diseases of Children

(Questions 1 and 2 are Compulsory)

1 Describe in detail the day's diet for a normal infant of one year old

2 Describe how fluid may be given to an infant otherwise than by the mouth State under what circumstances this may be necessary

3 Describe briefly the course and nursing management of a case of enteric (typhoid) fever

4 Say what you know of impetigo What steps would you take to prevent it from spreading to other children?

Surgical Diseases of Children

1 What is talipes equino varus? Describe the treatment of such a case

2 What are the causes of cervical adenitis? Describe shortly the treatment usually adopted

3 What is a hernia? Give the signs and symptoms of a strangulated hernia

4 What do you understand by—
(*a*) Immunity,
(*b*) Separation of an epiphysis
(*c*) General anæsthesia
(*d*) Necrosis,
(*e*) Polypus ?

General Nursing of Sick Children

1 What are the symptoms and signs that you would look for in a child suffering from severe anæmia ? Give the nursing care and diet of such a case

2 A child is brought to the Casualty Department by her mother who states she thinks she has swallowed lysol Give signs and symptoms that would make you think her statement is correct What would you do before the arrival of the doctor ?

3 Mention points to be considered in the general care of the operating theatre What care do you give the instruments after an operation ?

4 How will you instruct a probationer in the care and in the method of giving a feed to a normal infant at four months of age and how will you teach her to clean the utensils after use ?

THURSDAY, MAY 20TH, 1937

Infant Care in Health and Disease and Medical Diseases of Children

(*First Paper*)

MORNING

(Three Questions in all are to be Answered Questions 1 and 2 are Compulsory Time allowed—One and a half hours)

1 You are asked to show a young mother with her first baby exactly how to manage breast feeding Give in details your instruction

2 Describe briefly the course of broncho-pneumonia in a child State where the dangers to life arise and what you as a nurse may do to lessen the risk

3 Mention one type of case in which tube feeding may be prescribed for an infant Describe in detail how you would perform this

4 Describe in detail the diet which you might expect to be prescribed for a child of three years old suffering from coeliac disease

Surgical Diseases of Children

(*Second Paper*)

MORNING

1 What is empyema of the thorax ? Describe how it would be treated

2 Following an operation for the removal of tonsils and adenoids a child is noticed to become increasingly pallid and the pulse rate rises What is occurring ? Describe how the case should be treated

3 State briefly what is—
(a) A ranula
(b) Phimosis
(c) Hæmaturia
(d) Dermoid cyst
(e) Proctoscope

4 What is a nævus ? How would it be treated ?

General Nursing of Sick Children

AFTERNOON

1 What special care would you take in the feeding of a child for the first five days after each of the following operations
(a) Repair of hare lip
(b) Tracheotomy
(c) Removal of tonsils and adenoids
(d) Excision of glands of neck ?

2 What do you understand by anterior poliomyelitis (infantile paralysis) ? Describe fully the nursing care in the acute and the convalescent stages of a child aged eight years

3 Give a careful account of the nursing of a child suffering from tuberculous meningitis

4 Describe briefly the rashes associated with the following conditions
(a) Measles
(b) Inattention to the hygienic management of a young infant
(c) The giving of serum
(d) Congenital syphilis.

WEDNESDAY OCTOBER 13TH 1937

Infant Care in Health and Disease and Medical Diseases of Children

(*First Paper*)

MORNING

(Three Questions in all are to be Answered Questions 1 and 2 are Compulsory Time allowed—One and a half hours)

1 Give detailed instructions suitable for the guidance of a woman about to wean her infant How would you then feed such a child ?

2 Discuss the commoner causes of vomiting in infancy and childhood and the treatment of such cases

3 Describe a case of chicken pox How would you nurse it ?

1 How would you look after a child—
(*a*) Suffering from threadworms,
(*b*) Suffering from sore buttocks?

Surgical Diseases of Children

(Second Paper)

MORNING

1. Describe how you would prepare a case for an operation on the abdomen.
2. Give the symptoms of tubercle of the hip joint What are the principles of treatment of this disease?
3. State briefly what is tracheotomy, venesection, melæna, an ulcer, toxæmia
4. What is acute mastoiditis? What is the usual treatment?

General Nursing of Sick Children

AFTERNOON

1. You arrive at a private house at 5 p.m. to undertake the care of a boy aged six years who is to have his tonsils and adenoids removed at 9 a.m next morning Give full details as to your duties between these times
2. What is meant by the term a balanced diet? Discuss some of the ill effects on the nutrition of a child which may be caused by an ill balanced diet
3. For what purpose in nursing are the following used:
(*a*) Ice bag,
(*b*) Cradle;
(*c*) Flatus tube;
(*d*) Fomentation;
(*e*) Oxygen;
(*f*) Sandbag?
4. Give the nursing care and management of a baby six months old suffering from whooping cough

WEDNESDAY, FEBRUARY 2ND, 1938

Infant Care in Health and Disease, and Medical Diseases of Children

(First Paper)

MORNING

(Three Questions in all are to be Answered Questions 1 and 2 are Compulsory. Time allowed—One and a half hours)

1. How would you nurse a case of chorea? What complications may result from this disease?

2 What would lead you to suppose that a child is mentally defective?

3 State briefly what you mean by —

(*a*) Hypoglycæmia
(*b*) Cretinism
(*c*) Mongolism?

4 Describe the common complications of scarlet fever

Surgical Diseases of Children

(Second Paper)

MORNING

1 Give the signs and symptoms of dislocation of the elbow and describe how this condition is usually treated

2 What precautions should be taken and what treatment may you be required to apply in a case of vaginal discharge?

3 What are the signs of a calculus in the duct of the submaxillary gland? How would it be treated?

4 Give the definition of —

(*a*) Hypospadias
(*b*) Cellulitis
(*c*) Pes planus
(*d*) Immunity
(*e*) Meningocele

General Nursing of Sick Children

AFTERNOON

1 What instructions would you give a junior nurse regarding the giving of medicines? What rules would you yourself observe in the giving of dangerous drugs and the care of the poison cupboard?

2 Give an account of the nursing care which should be given to a child of seven years of age suffering from catarrhal jaundice

Arrange a diet and write a report for the doctor

3 Describe briefly how you would prepare for the following treatments —

(*a*) Bladder lavage
(*b*) Œsophageal feed
(*c*) *Blood transfusion*,
(*d*) Olive oil enema?

4 How can the nursing staff aid the hospital authorities in ward economy?

WEDNESDAY, MAY 11TH 1938

Infant Care in Health and Disease and Medical Diseases of Children

(First Paper)

MORNING

Three Questions in all are to be Answered Questions 1 and 2 are Compulsory Time allowed—One and a half hours.)

1 What are the advantages of, and contra indications to, breast feeding? How would you feed artificially a normal baby of one month old?

2 What are the clinical features of rickets and what steps should be taken to prevent a child developing this disease?

3 What is meant by —

(a) Complementary feeding,
(b) Test feeding,
(c) Coma,
(d) Carpo pedal spasm,
(e) Tic?

4 Describe the symptoms of acute bronchitis How would you nurse a child of five years of age suffering from this complaint?

Surgical Diseases of Children

(Second Paper)

MORNING

1 Describe the treatment of bow legs in a child of three years of age What instructions should be given to the mother of such a child attending an Out patient Department?

2 What are the various degrees of burning? Describe —

(a) First aid treatment
(b) Final treatment in a hospital

3 What is myringotomy? For what is it performed? Describe the after care of a case

4 Give the definition of —

(a) Conjunctivitis,
(b) A slough,
(c) Teno synovitis,
(d) A wheal,
(e) An embolus

General Nursing of Sick Children

AFTERNOON

1 What, in your opinion are the essential qualifications and attributes of a good sick children's nurse?

2 You are in charge of a nursery of children under 18 months of age One child has had three loose stools in 12 hours State fully what you would do —

(a) As regards obtaining medical advice,
(b) Before you received any orders

3 How would you prepare and apply —

(a) A starch poultice,
(b) A turpentine stupe,
(c) A hot wet pack,
(d) An ice bag ?

4. How would you nurse a case of German measles in a private house and what steps would you take to prevent the spread of infection ?

WEDNESDAY OCTOBER 12TH 1938

Infant Care in Health and Disease and Medical Diseases of Children

(*First Paper*)

MORNING

(Three Questions in all are to be Answered Questions 1 and 2 are Compulsory Time allowed—One and a half hours.)

1 Discuss the commoner causes of persistent crying in a young infant

2 Describe epileptic attacks occurring in childhood How would a child suffering from this disease best be handled ?

3 Give the clinical features of scurvy How can this condition be prevented and treated ?

4 What would lead you to suppose that an infant was prematurely born ? How would you nurse such an infant ?

Surgical Diseases of Children

(*Second Paper*)

MORNING

1 Describe the clinical features of congenital pyloric stenosis What treatment may be adopted, and how is the infant nursed ?

2 What is surgical shock ? What methods are taken to combat this condition ?

3 What treatment is usually undertaken for a child with a bead in the external auditory meatus ?

4 Give the definition of —

(a) Icterus,
(b) Atresia of the rectum,
(c) Pes cavus,
(d) Gangrene
(e) Hæmatemesis

General Nursing of Sick Children

AFTERNOON

1 State briefly what should be a nurse's conduct towards :—
   (*a*) Patient,
   (*b*) Visitors,
   (*c*) Medical officers,
   (*d*) Nurses junior to herself,
   (*e*) The nursing profession as a whole ?

2 Give the symptoms of a child suffering from acute nephritis State the general nursing points in this condition

3 What are the nurse's duties regarding the care of the various utensils kept in—
   (*a*) The ward kitchen,
   (*b*) The ward bathroom,
   (*c*) The ward lavatories ?

4 How would you deal with the following emergencies prior to the arrival of the doctor :—
   (*a*) Spasmodic croup,
   (*b*) Hæmorrhage,
   (*c*) Concussion ?

WEDNESDAY, FEBRUARY 1ST, 1939

Infant Care in Health and Disease, and Medical Diseases of Children

(*First Paper*)

MORNING

(Three Questions in all are to be Answered Questions 1 and 2 are Compulsory Time allowed—One and a half hours)

1 Describe a satisfactory feeding regime for an infant of nine months

2 Describe the onset and course of a case of measles Give a list of its common complications

3 What urinary signs and symptoms occur in—
   (*a*) Pyelitis ?
   (*b*) Nephritis ?

4 How would you nurse a case of acute poliomyelitis ?

Surgical Diseases of Children

(*Second Paper*)

MORNING

1 Describe the clinical features of a case of septic arthritis of the knee joint in a young child What treatment have you seen given ? How would such a case be nursed ?

2 Describe the treatment and the nursing of a case of tetanus

3 What treatment is usually adopted for rectal prolapse ?

4 Give the definition of—
(1) Paraphimosis
(2) Rhinitis
(3) Callus
(4) Cellulitis.
(5) Dislocation

General Nursing of Sick Children

AFTERNOON

1 Mention some points relating to the patients' comfort, the necessity for which a staff nurse must impress upon her probationers

2 Mention three common conditions which cause "difficult breathing" State in each case what steps you would take to relieve the child's distress while awaiting instructions from a doctor

3 Give a brief description of a rigor How would you distinguish between a rigor, a faint, and a convulsion ?

4 What do you understand by personal hygiene ?

WEDNESDAY MAY 10TH 1939

Infant Care in Health and Disease and Medical Diseases of Children

(First Paper)

MORNING

(Questions 1 and 2 are Compulsory Questions 3 and 4 are alternative Three Questions must be Answered Time allowed —One and a half hours.)

1 How would you feed artificially a normal infant, three months of age ?

2 Describe the clinical features in the case of a child suffering from pneumonia How would you nurse such a case ?

3 How would you manage a child who seems to lack appetite and fails to eat properly ?,

4 What symptoms and signs are likely to be present in a case of meningitis ?
How would you expect such a case to be treated ?

Surgical Diseases of Children

(Second Paper)

MORNING

1 What do you understand by general anæsthesia ? Describe how a child would be prepared for this, and the various forms of pre medication that may be ordered

2 How would you deal with a child suffering from a severe lacerated wound, prior to the arrival of a medical officer ?

3 Give the definition of—
(*a*) Infection
(*b*) Septicæmia
(*c*) Ecchymosis
(*d*) Synovitis
(*e*) An abrasion

4 What is fissure in ano? How have you seen it treated?

General Nursing of Sick Children

AFTERNOON

1 For what condition is gastric lavage performed? Describe the procedure in detail

2 What is aspiration? For what reason is it performed? What signs and symptoms must be watched for during the process?

3 Describe in detail the care and sterilisation of infants feeding bottles What particular attention should be paid to the teats?

4 What effect may a prolonged period in hospital have upon a child's mind? How may any possible ill effect be prevented by the nurse?

HOSPITAL FOR SICK CHILDREN, GREAT ORMOND STREET

Senior Nurses' Medical Examination

(Five Questions only to be answered Time allowed—2 hours)

APRIL, 1934

(Questions 1 and 2 are Compulsory)

1 (*a*) Give the quantities of food required for an infant weighing 8 lb if fed (*a*) on the breast (*b*) on cow's milk (*c*) humanised dried milk (*d*) full cream dried milk.

(*b*) What vitamins might possibly be absent from some of these foods, and if so what steps would you take to make up for this deficiency?

2 Describe fully the clinical picture nursing care, and treatment with complications, of a child suffering from measles

3 In the case of a child of seven years suffering from diabetes what symptoms would you expect? Describe the diet and treatment and state what complications should be looked for

4 How would you nurse a severe case of rheumatic arthritis and what complications would you look out for?

5 A child of one year is suffering from cerebro-spinal meningitis Describe the clinical picture, and nursing care and treatment of such a case

6 Give in detail the clinical picture and nursing with feeding of a case of congenital pyloric stenosis treated (*a*) medically, and (*b*) surgically

MARCH, 1935

(Questions 1 and 2 are Compulsory)

1 Outline the feeding of an infant from birth until nine months using fresh cow's milk.

2 Enumerate the causes of stricture during childhood and give the treatment of *any one* of these

3 Give the nursing care and treatment of a baby of six months suffering from broncho pneumonia

4 What are *the symptoms of acute pyelitis*? Indicate the treatment

5 What do you understand by the following terms —
Cyclical vomiting Tenesmus Tetany Leucopenia. Lesbianism. Interstitial keratitis. Functional albuminuria.

6 Give the incubation period of, and describe the symptoms of scarlet fever Give the nursing care and treatment of this disease What complications may arise ?

MARCH, 1936

1 Describe in detail the care of the premature baby

2 Write out a day's diet sheet for the following children —
(*a*) A healthy baby nine months old
(*b*) A child of three years with coeliac disease
(*c*) A child aged seven with diabetes mellitus
(*d*) A child aged ten grossly overweight

3 Which skin diseases are infectious ? Describe the treatment of any two of them

4 What steps may be taken to prevent the following diseases —
(*a*) Congenital syphilis
(*b*) Measles
(*c*) Diphtheria
(*d*) Tuberculosis ?

5 What are the various causes of stridor in childhood Give full details including treatment of any two of them

DECEMBER, 1937

1 Compare the relative merits of breast feeding and feeding on fresh cow e milk, dried cow's milk, and condensed cow's milk

2 Under what circumstances is oxygen likely to be ordered ? How may it be administered ?

3 Write out a day's menu for (1) a boy aged ten years grossly overweight, (2) a boy aged four years with catarrhal jaundice, (3) a healthy child aged fifteen months

4 What would lead you to suspect mental deficiency in a baby nine months old ? Describe any two types of mentally defective children

5 Describe the symptoms and give the nursing details, of a case of infantile scurvy

Senior Medical Examination

DECEMBER 15TH, 1938

(Only Four Questions to be Answered)

(Question 5 is Compulsory)

1 Describe the preparation of lactic acid milk. What are the indications for the use of this food ?

2 Describe the immediate and remote effects of an injury to the brain sustained at birth

3 A child, aged one year, is reported to have passed blood with the motions. What are the possible causes of this? Indicate the treatment of any two of the causes.

4 Give an account of the nursing particulars of a case of rheumatic pericarditis.

5 Describe a case of measles What are the incubation and quarantine periods? What complications may arise?

WESTMINSTER HOSPITAL

Senior Nurses' Medical Paper

DISEASES OF CHILDREN

(Time allowed—Two Hours)

JULY 23RD, 1934

(Questions 1 and 2 are Compulsory)

Not more than Four Questions to be Answered

1. (*a*) How would you prove that a baby was being underfed on the breast, and what steps would you take to remedy this defect and make the baby thrive?
   (*b*) What quantities and at what times would you feed an infant weighing 12 lb., fed on
   1. Full cream dried milk.
   2. Humanised dried milk.
   3. Cow's milk?

2. Tell what you know about *Paratyphoid B.* infection. What nursing precautions would you take? and describe fully the nursing care and treatment of a child suffering from this disease.

3. What are the common causes of diarrhœa in infants, and how would you nurse a severe case in an infant of three months?

4. Describe the clinical picture and give in detail the nursing care and treatment of a little girl aged two years, suffering from *pyelitis.*

5. Describe very briefly the types of meningitis which you know of in infancy and childhood and give in detail the nursing care and treatment of one type.

6. State in a few words what you know about
   Dick test.
   Cistern puncture.
   Soxhlet apparatus.
   Wind swallowing.
   Mongolism.
   Cœliac disease.
   Mantoux test.
   Schick test.

Senior Nurses' Medical Paper in Diseases of Children

JUNE 5TH, 1936

(Questions 1 and 2 are Compulsory)

Not more than Five Questions to be Answered

1 (*a*) What are the main differences between cow's milk and breast milk, and what are the chief advantages of breast feeding?

(*b*) How would you proceed to wean an infant aged three months, and what food would you choose, and why?

2 Describe the symptoms, nursing care, and treatment, of an infant suffering from congenital pyloric stenosis

3 How would you nurse the following —

(*a*) An infant suffering from eczema

(*b*) A boy of five years in the last stages of tuberculous meningitis?

4 Give briefly the clinical picture and nursing care and treatment of a child of eight years suffering from measles What complications might arise, and how would you meet them?

5 How would you manage a child of three years with —

(*a*) Severe constipation?

(*b*) Vomiting after tonsillectomy?

6 State in a few words what you know about each of the following —

(*a*) Cretinism

(*b*) Pyonephrosis

(*c*) Vitamin D

(*d*) Full cream dried milks

(*e*) Mantoux test

OCTOBER, 1937

Examination of Medical Diseases in Children

(Questions 1 and 2 are Compulsory)

Not more than Five Questions to be Answered

1. Write out suitable feeding directions as you would give them to an inexperienced mother so that she may rear a healthy baby of three months old, the breast feeding of which has had to be stopped

2 What acute infectious diseases do children suffer from, and what are their incubation periods? Describe one of them in detail.

3 What is the cause of cerebro-spinal meningitis, and how would you nurse a child of seven years suffering from this?

4 Tell what you know of acute rheumatism in childhood How would you nurse a boy of seven years suffering from this and what complications would you look for ?

5 Describe symptoms and course of lobar pneumonia in a child of four years, and the nursing

6 What is malena ? Discuss its commonest causes in infancy

Senior Nurses' Medical Paper, 1939

(Questions 1 and 6 are Compulsory)

Not more than Five Questions to be Answered Time allowed—Two hours

1 (*a*) How would you treat a breast fed infant who was screaming, and failing to gain weight ? What steps would you take to increase the flow of breast milk ?

(*b*) How does cow's milk differ from breast milk, and how would you modify the former to make it more digestible ?

2 What are the clinical manifestations of rheumatism and how would you nurse a severe case of rheumatic fever in a child of nine years ?

3 (*a*) How do children contract pulmonary tuberculosis and how do they show it ?

(*b*) Explain how you would nurse a case of tuberculous meningitis

4 Tell what you know of measles, its complications, and the nursing of such a case

5 How would you treat (*a*) Enuresis,
(*b*) Thread worms,
(*c*) Scabies,

in a child of five years

6 On what would rest the diagnosis of pyloric stenosis, and what would the treatment and nursing consist of ?

SOCIETY OF APOTHECARIES OF LONDON

Mastery of Midwifery Examination in Pædiatrics

NOVEMBER 21ST, 1934

(Question 5 is Compulsory)

1 A breast fed infant, three months old is losing weight Describe the steps you would take to investigate such a case and give in detail any treatment you might adopt

2 Discuss the significance of melæna in the infant

3 Give the differential diagnosis and treatment of rashes in the "napkin area" of an infant of three months

4 What precautions do you consider necessary for the prevention of tuberculous infection in the infant ?

5 On what evidence would you base an opinion that a child of twelve months is in a state of perfect health ?

MAY 22ND, 1935

(Question 5 is Compulsory)

1 Give the differential diagnosis and treatment of vomiting in an infant under the age of six months

2 Discuss the causes and treatment of fever occurring in an infant in the first four weeks of life

3 What specific measures are available to protect a child from any of the acute infectious fevers ?

4 What disturbances may you find in the infant of a "highly strung" mother ?

5 A normal, newly born baby has to be artificially fed Give in detail your diet for such an infant, and the reasons for your choice of food

NOVEMBER 20TH, 1935

(Question 5 is Compulsory)

1 Give an account of the symptoms and signs of acute polio myelitis

2 Discuss "physiological jaundice" in the new born.

3 A young child has laryngeal obstruction Give the differential diagnosis and treatment

4. Describe the signs and symptoms of overfeeding in a breast-fed infant. What steps would you take to deal with this condition ?

5. What are the fluid requirements of the infant ? What are the clinical manifestations of (*a*) too little fluid, (*b*) too much fluid, in the infant's diet ?

MAY 20TH, 1938

(Question 5 is Compulsory)

1. What are the causes of chronic diarrhœa in a child aged three years ?

2. Discuss the etiology of nutritional anæmia in infancy. How may such a disorder be prevented ?

3. Describe the clinical features and discuss the prognosis of intra cranial injury in the new-born.

4. Give in detail the management and feeding of a premature infant weighing three pounds at birth.

5. Discuss the common causes of failure on the part of the mother to breast-feed her child.

NOVEMBER 18TH, 1936

(Question 5 is Compulsory)

1. Discuss the etiology of "fits" in infancy. Outline your treatment of "fits."

2. Describe the development of the infant in relation to a diagnosis of mental deficiency.

3 What are the clinical features and complications of pyelitis in infancy ? Give in detail your treatment of this disorder.

4. Describe the varieties of stomatitis that may occur in infancy. How may such disorders be—

   (*a*) Prevented.

   (*b*) Treated.

5. Give in detail the instructions you would supply to the mother of a normal breast-fed infant to enable her to institute "mixed feeding." At what age should "mixed feeding" be begun ?

MAY 19TH, 1937

(Question 5 is Compulsory)

1. Describe the physiology of lactation and state what steps you would take to increase a failing supply of breast milk.

2. Give the etiology, clinical features and treatment of birth injuries to the brachial plexus.

3 Discuss the causes of fever in the newly born infant

4 Compare the advantages and disadvantages of raw, boiled pasteurised and dried milk for the feeding of infants

5 What directions would you give for the artificial feeding of an infant during the first two weeks of life ?

NOVEMBER 9TH, 1937

(Question 5 is Compulsory)

1 What evidence would lead you to diagnose mental deficiency in a child aged two years ?

2 Give the clinical features and treatment of hæmorrhagic disease of the newly born

3 Discuss the etiology and prevention of rickets

4 Describe briefly the methods that are in use to protect children from the acute specific fevers

5 Give the differential diagnosis of vomiting in an infant under one year of age

MAY 11TH 1938

(Question 3 is Compulsory)

1 Give in detail the treatment you would adopt for diarrhœa and vomiting in an infant aged six months

2 Discuss cyanosis in the newly born What are your views with regard to the prognosis in this condition ?

3 A breast fed infant three months old, is losing weight, describe the steps you would take to investigate and treat such a case.

4 What are your views concerning the compulsory pasteurisation of milk ?

5 Discuss the etiology and treatment of infantile eczema

NOVEMBER 16TH, 1938

(Question 5 is Compulsory)

1 Describe the clinical features of congenital syphilis in infancy

2 Give the causes and treatment of constipation in the infant

3 A mother brings her infant to you with a history that the child has not moved the right leg for twenty four hours Discuss the differential diagnosis in this case

4 Discuss jaundice in the newly born.

5 Give in detail your treatment of a premature infant weighing 3¼ lb

MAY 10TH, 1939

(Question 5 is Compulsory)

1 Give the clinical features and treatment of cœliac disease

2 Discuss the etiology of the cerebral palsies of childhood

3 Describe in detail your treatment of pneumonia in infancy

4 What are the clinical features of intussusception? Discuss the differential diagnosis of this condition

5 Give the principles on which you would feed an infant artificially Illustrate your remarks by reference to a normal infant aged two months, weighing 10 lb

THE HANBURY PRIZE EXAMINATION IN DISEASES OF CHILDREN

Westminster Hospital

JUNE 25TH, 1934

(Time allowed—Two Hours)

1 Give an account of the symptomatology and treatment of infantile scurvy

2 (*a*) You are consulted by the father as to the feeding of a healthy infant aged three months, whose mother has just died The baby is to be in charge of a sensible, but inexperienced woman Give your written instructions

(*b*) State a suitable dose for each of the following drugs *administered to a patient aged five years* —
Chloral hydrate
Hexamine
Santonin

3 What manifestations may be encountered during the course of juvenile rheumatism ?

4 Give an account of the symptoms and clinical signs of *one only* of the following —
Erythrœdema polyneuritica (Pink disease)
Cerebellar neoplasm

JUNE 27TH, 1935

(Time allowed—Three Hours)

1 *You are asked to see a breast fed infant who is failing to* gain weight How would you investigate and treat such an infant ?

2 Tell what you know about rickets

3 What forms of meningitis are there ? State briefly the difference in the cerebro spinal fluid in each type and some of the differentiating points between them

4 A girl of seven years has acute chorea Tell what you know of this condition, and how you would treat it, giving the possible complications

TUESDAY, JUNE 23RD, 1936

(Time allowed—Two Hours)

1 Give the symptoms and *signs of pleurisy with* effusion How would you treat a young patient so affected ?

2 Describe the recognition of activity in rheumatic carditis and the treatment in an active phase of the condition

3 Give an outline of the varieties and causes of mental deficiency in infancy and childhood

TUESDAY, JULY 13TH, 1937

(Time allowed—Two Hours)

1 In making a rapid examination of an ill child, what are the salient points of the examination and why?

2 Give briefly the diagnosis, investigation, and treatment of a moderately severe case of bronchiectasis in a child aged five years

3 Give an account of the etiology of the motor paralyses of infancy and childhood

4 Define shortly —
Spasmus nutans
Nephrosis
Spasmophilia
Meningism

DECEMBER, 1938

1 State briefly what you know of the different types of meningitis, giving the etiology, pathology, clinical picture, and treatment

2 An infant was born weighing 7 lb At the end of 3 months the weight was 8 lb
(a) Give its expected weight and the directions you would give to the mother about its feeding if it were fed on cow's milk mixture or humanised dried milk mixture
(b) What are the chief errors in the technique of infant feeding which one would meet with in general practice?

3 How would you investigate a girl aged three years with pyrexia of unknown origin, and what would be the commoner causes of fever at this age?

4 State what you know about ordinary measles, and how you would look after a boy aged six years, with this complaint

JUNE, 1939

1 Give briefly the four chief vitamins, telling what you know of each

2 (a) Define the following "Expected weight, Test feed, Complementary feed, Supplementary feed"
(b) How would you feed a normal infant of ten weeks, weighing 10 lb, on cow's milk or on a dried milk?
State in detail the directions you would give to the mother

3 What are the indications for tonsillectomy? State what symptoms and complications follow on diseased tonsils and adenoids

4 Tell what you know of the clinical picture, differential diagnosis, and treatment of mumps, with its complications

THE ROYAL SANITARY INSTITUTE IN CO-OPERATION WITH THE ASSOCIATION OF NURSERY TRAINING COLLEGES

Examination for Nursery Nurses

LIVERPOOL, NOVEMBER 5TH AND 6TH 1937

(First Paper)

FRIDAY MORNING

Four Questions only to be Answered Time allowed—Two hours

1 Write a short description of the digestive system, stating the various organs through which the food passes and the main changes which take place in the process of digestion

2 What are the advantages of sufficient rest and sleep? Describe the condition you might find in a child suffering from the effects of lack of sleep

3 How would you undertake the cleaning of your nursery (*a*) daily (*b*) weekly?

4 Why is it essential that vitamin C should be present in the diet? How can it be ensured that it is obtained by a bottle fed infant?

5 What is a protein? In what foodstuffs does it occur? Discuss the importance of protein in the diet of an infant

6 What are the common causes of sore buttocks and how would you deal with them?

(Second Paper)

FRIDAY AFTERNOON

Four Questions only to be Answered Time allowed—Two hours

7 How does a very young baby get exercise? Why is exercise necessary for it?

8 Why is it so important that children should have the companionship of other children?

9 *What is the value to the young child of painting experience?* What material would you provide and along what lines would you guide his work?

10 If a breast fed baby of six weeks was screaming night and day and the father suggested weaning *what would you* suggest for the happiness of the household?

11 Why is diphtheria a serious disease? What do you know of its prevention and treatment in its early stages?

12 A child has put its arm through a glass window and has cut the artery at the wrist. Describe the steps you would take for first aid treatment.

LONDON, JANUARY 7TH AND 8TH, 1938

(First Paper)

FRIDAY MORNING

Four Questions only to be Answered. Time allowed—Two hours.

1 Describe the process of respiration.

2 What are the benefits of the direct rays of the sun to a child? In what circumstances may they prove dangerous or *harmful*?

3 Give a description of a nursery which in your opinion would be hygienically perfect.

4 State what you know of the value of *eggs in the diet*. At what age would you first give eggs and how are they best cooked?

5 For what purposes is water essential in the human body?

6 What would you consider suitable clothing for (*a*) a baby of five months, (*b*) a child of five years, on a warm July day?

(Second Paper)

FRIDAY AFTERNOON

Four Questions only to be Answered. Time allowed—Two hours.

7 What are the advantages of regular physical exercises for children and what form of exercise would you advocate *for children under six years of age*?

8 What is habit? How would you lead a child to form the habit of obedience?

9 In the light of your experience of children at play, discuss the wisdom of providing them with educational toys.

10 What symptoms in a child of four would lead you to suppose enlarged adenoids and tonsils were present? Describe where these organs be.

11 What do you understand by an infectious disease?

12 What is a fomentation? How would you make one? What are the differences between a fomentation and a poultice? Which do you prefer and why?

LONDON APRIL 22ND AND 23RD 1938

(First Paper)

FRIDAY MORNING

Four Questions only to be Answered Time allowed—Two hours

1 What are the functions of (*a*) the skin (*b*) the kidneys ?

2 Write a short essay on the management of a child three years old and a baby six months old at the seaside.

3 What are the means by which a nursery may be ventilated ?

4 Describe the meals for one day of a normal infant aged 1½ years

5 What different kinds of milk can be used in infant feeding ?

6 What purposes do clothes serve ? What general principles should be borne in mind in clothing young children ?

(Second Paper)

FRIDAY AFTERNOON

Four Questions only to be Answered Time allowed—Two hours

7 Of what value is the teaching of handwork in the training of the young child ?

8 What is the importance of play in the education of young children ? What is meant by free ' play ? Why is it better for a child to play with other children rather than with his parents or other adults ?

9 How far is it possible to use suggestion in the training of young children ? Give examples of harmful suggestion

10 What do you know of the conditions commonly known as (*a*) mastoid (*b*) rickets (*c*) "St Vitus Dance and (*d*) discharge from the eye of a baby ? Indicate the importance and significance of each

11 Give the names of some useful chemical disinfectants How are woollens best purified and disinfected ?

Quote the incubation period (in days) of measles and the quarantine (in days) after exposure to infection of measles When does the period of infection end in this disease ?

12 For what purposes in the nursery would you use (*a*) iodine, (*b*) olive oil (*c*) Friar's Balsam (*d*) castor oil (*e*) bicarbonate of soda ?

LIVERPOOL JUNE 17TH AND 18TH 1938

(First Paper)

FRIDAY MORNING

Four Questions only to be Answered Time allowed—Two hours

1 Give a brief outline of the bones forming the skeleton.

2 Describe in detail how and where you would bath a baby nine months old

3 What cot would you choose for a baby ?
How would you furnish the cot ?

4 What is the difference between boiled and pasteurised milk ?
Which do you prefer for young children ? State your reasons

5 Discuss the causes of loss of appetite in a child between the ages of one and two years

6 What principles would guide you in selecting footwear for a child aged three years for indoor and for outdoor use ?

(Second Paper)

FRIDAY AFTERNOON

Four Questions only to be Answered Time allowed—Two hours

7 Why is it bad for a very young child to be too long on its feet especially walking on pavements ?

8 How would you train a child (*a*) to honesty, (*b*) to independence (*c*) to self control (*d*) to obedience ?

9 What do we mean by irrational fears ? Howwould you deal with a child who was afraid of (*a*) having her hair washed (*b*) being left alone in a room, (*c*) going through a tunnel in a train ?

10 What action would you take in the case of a constipated child ?

11 Describe in detail the measures you would take for the treatment of a slight discharge of the eye.

12 Describe first aid for (*a*) a burn (*b*) a bleeding nose and (*c*) a fit in a child

LONDON, JULY 22ND AND 23RD, 1933

(First Paper)

FRIDAY MORNING

Four Questions only to be Answered Time allowed—Two hours

1 What is the normal temperature of the body ? How would you take and record the temperature of (*a*) an infant (*b*) the nursery ?

2 How would you deal with what are generally known as "bad habits" ? Give examples

3 How would you heat and ventilate a sick room ? Set out the advantages and disadvantages of an open fire

4 What would lead you to believe that a breast fed infant was being overfed ? Outline your management of a case of overfeeding at the breast

5 What is meant by the terms (*a*) protective and (*b*) energy giving foods ? Name the most important of each type

6 Of what material would you make infants napkins and how many would you allow for one child? How would you wash napkins? What soap would you use? How would you whiten them if they became stained?

(Second Paper)

FRIDAY AFTERNOON

Four Questions only to be Answered Time allowed—Two hours

7 How would you ensure that a child in your care developed a good carriage?

8 What would make you think that a child two years old was abnormally backward?
What is tongue-tie?

9 Why should children be encouraged to keep pets? What pets would it be possible to keep with children under seven years of age (*a*) if living in the country, (*b*) if living in a large town?

10 If a child recently put into your charge complains frequently of fatigue how would you proceed to find the cause?

11 What particular symptoms would lead you to suspect that a child was suffering from (*a*) scarlet fever (*b*) measles (*c*) whooping cough?

12 State briefly how you would arrange a nursery medicine cupboard How are bottles containing poisons distinguished?

LIVERPOOL, NOVEMBER 4TH AND 5TH 1938

(First Paper)

FRIDAY MORNING

Four Questions only to be answered Time allowed—Two hours

1 What is the composition of human blood? Enumerate its various functions

2 Give reasons for and against cold baths for children and discuss their possible advantages and disadvantages

3 What are the chief points to look for when selecting a suitable place for a summer holiday with young children?

4 State the dangers of giving ordinary raw cow's milk to an infant and describe how these dangers may be overcome

5 Describe how you would keep the food in hot weather in a small flat if there were no refrigerator

6 What clothing would you advise for a baby aged three months? Describe the garments and the material of which they should be made Give the number required

(Second Paper)

FRIDAY AFTERNOON

Four Questions only to be Answered Time allowed—Two hours

7 What rules should be observed so that a child may have perfect milk teeth? When do the permanent teeth begin to appear?

8 Trace the evidences of the growth of imagination in a child during the first five years of life

9 What is the special value of nature study in the training of the young child? Show how you could help the town child to a true study of Nature

10 What are the commoner causes of (*a*) diarrhœa, (*b*) feverishness in a baby aged seven months?

11 What is "itch" What precautions would be necessary in dealing with a case in a house where there were other children?

12 If you were asked to make up a first aid outfit for use in emergencies in the nursery, what would the contents of it be?

LONDON, JANUARY 13TH AND 14TH, 1939

(First Paper)

FRIDAY MORNING

Four Questions only to be Answered Time allowed—Two hours

1 Describe the structure of the mouth Explain how bad teeth may affect the health and describe how a child can be helped to have good teeth

2 What suggestions would you make to a young mother as regards head-coverings for a young child in winter and summer? Give reasons

3 What do you consider the most important points in the selection and making up of a cot for a child from nine months of age onwards?

4 How would you prepare whey, beef tea, steamed custard and broth containing calcium for a baby suffering from rickets? What vegetables would you put into the broth?

5 What are the best means to employ in cooking food for children? Give your reasons.

6 What type of bedding do you consider to be best for (*a*) a young baby, (*b*) children up to five years of age?

(*Second Paper*)

FRIDAY AFTERNOON

Four Questions only to be Answered Time allowed—Two hours

7 When should a child learn to walk? What are the dangers of walking too early?

8 How would you help an infant to grow up independent and self-controlled?

9 Imagine a morning spent in a nursery with two children aged two years and four years, what part would you play in the *arrangement of the morning's activities*?

10 Write short notes on (*a*) German measles, (*b*) adenoids (*c*) ringworm (*d*) threadworms.

11 What is meant by impetigo? What precautions would you take with regard to the other children in a family of children one of whom developed this affection?

12 Where would you keep your medicine cupboard and with what would you stock it? What would you use in applying first aid on account of (*a*) a scraped elbow, (*b*) a wasp sting, and (*c*) a sprained ankle?

LONDON APRIL 20TH AND 21ST, 1939

(*Special Paper for Jewish Candidates*)

Four Questions only to be Answered Time allowed—Two hours

THURSDAY AFTERNOON

Four Questions only to be Answered Time allowed—Two hours

7 Why is exercise necessary? How should an infant of six months obtain sufficient exercise?

8 Suggest some possible causes of destructiveness in children
Is this quality necessarily harmful?
How would you deal with a destructive child aged four years?

9 Discuss the value and the danger of habit forming as it affects the training of the character

10 What action would you take if a child in your care developed a discharge from the eye? To what cause might this condition be due?

11 How would you prepare a room to nurse a child suffering from an infectious illness?

12 Outline *the first-aid treatment* for (*a*) a cut artery in the wrist, (*b*) a fit in a six months old child (*c*) a superficial burn

LONDON APRIL 21ST AND 22ND 1939

(First Paper)

FRIDAY MORNING

Four Questions only to be Answered Time allowed—Two hours

1 What are the functions of the skin? What are the characteristics of a healthy skin?

2 What are the chief causes of (*a*) constipation (*b*) diarrhœa in an infant? How would you deal with these conditions?

3 Give an account of how you would furnish and decorate the ideal day nursery for a child aged three years

4 What substitutes for breast feeding are most commonly used? State briefly and concisely the advantages and disadvantages of each.

5 What are vitamins? Enumerate the principal vitamins, say where they are to be found and describe the effects of their absence or deficiency

6 What points should be considered when choosing clothes for children?

(Second Paper)

FRIDAY AFTERNOON

Four Questions only to be Answered Time allowed—Two hours

7 What exercise and sensory stimulation do babies need during the first year of life? Explain the importance of this sensory stimulation

8 What do you know of any laws governing the formation of habits? What do you consider the most important habits to be formed by children in the nursery?

9 'Let Nature be your teacher' What can a child of nursery age learn from Nature?

10 What would make you think that a child was inclined to be flat footed? How could this be counteracted?

11 What steps do you consider it necessary for the nurse to take in regard to the 'feverishness' so liable to occur in childhood? Which of these steps do you consider the most important and why?

12 What assistance would you render to a child who had been badly bitten by a dog?

LIVERPOOL JUNE 16TH AND 17TH 1939

(First Paper)

FRIDAY MORNING

Four Questions only to be Answered Time allowed—Two hours

1 Describe the structure of the kidneys and their function

2 What measures should be taken to ensure that the milk teeth keep healthy ?

3 State the dangers which might occur when exposing a child to bright sunlight and describe the precautions you would take to prevent them

4 Write out suitable menus for a day for a child aged 15 months and for one aged three years

5 Describe how you would prepare a dried milk feed and how you would clean the feeding bottle and teat afterwards

6 What ill effects may result from the use of badly fitting foot wear ? *How may these be avoided or treated ?*

(Second Paper)

FRIDAY AFTERNOON

Four Questions only to be Answered Time allowed—Two hours

7 Why are proper rest and suitable exercise necessary for a child ?

8 Discuss the relative merits of free play and organised play

9 What are the values of story telling ? What kind of stories would you choose and why ?

10 Say what you mean by a ' perfectly healthy child "

11 Describe the onset of (*a*) measles, (*b*) scarlet fever, and (*c*) diphtheria

12 Describe what emergency nursing treatment you would institute in the home before the arrival of the doctor for a child who has just suffered from a "fit" the nature of which is unknown

LONDON, JULY 20TH, 21ST AND 22ND, 1939

(First Paper)

THURSDAY AFTERNOON

Four Questions only to be Answered Time allowed—Two hours

1 Give a brief description of the arteries veins and capillaries and the circulation of the blood through them.

2 What are the chief points to remember in bathing a tiny baby ?

3 In a country cottage without "modern conveniences,' what steps would you take to protect and preserve your charges' milk supply from the moment it is delivered at the house ?

4 What grade of milk would you recommend for a child ? If the grade you recommend is not available what would be your next choice ? State your reasons

5 How would you prepare tripe sweetbread tomato purée baked apple prune puree and barley water for children two years of age ?

6 Describe methods of washing and drying a flannel nightgown, a silk and wool vest, a blue silk frock white woollen socks a woollen cardigan and a white cotton pillow case

(Second Paper)

FRIDAY MORNING

Four Questions only to be Answered Time allowed—Two hours

7 Suggest suitable handwork for a convalescent child aged five years

8 What do you consider are the essential types of toys which should be selected for a child aged four years in any nursery ? Give reasons.

9 Too much rigidity in nursery routine is not desirable Discuss this proposition fully

10 If a child of three years were constantly catching cold what might be the causes ?

11 What conditions or diseases may affect a child's head ? How may they be prevented ?

12 What would you do if a small boy in your charge, on jumping downstairs fell and on being picked up was unable to stand on his right foot ?

NATIONAL SOCIETY OF DAY NURSERIES AND THE NATIONAL ASSOCIATION FOR THE PREVENTION OF INFANT MORTALITY

Advanced Creche Workers' Examination

SATURDAY JUNE 23RD, 1934

(Time allowed—Two hours)

1 Write an essay on teething giving its possible troubles

2 How would you feed a healthy baby of four months on ordinary milk ? Give quantities and method of preparation

3 What must you bear in mind when planning a diet sheet for the toddler ?

4 What are the advantages of breast feeding ?

5 Say what you know about
  1 Thrush
  2 Threadworms (giving treatment)
  3 The care of baby's scalp

Advanced Examination for Nursery Nurses

SATURDAY, MARCH 30TH, 1935

Five out of eight questions to be Answered
Time allowed—Two hours

1 What are the chief causes of defective teeth ?

2 What dangers may arise from a child who has been badly burnt How would you treat him ?

3 How would you nurse a case of bronchitis ? What could you do to prevent further attacks ?

4 When and why are the following used
  (*a*) Castor oil
  (*b*) Bicarbonate of soda
  (*c*) Radiostoleum ?

5 Why is ante natal care necessary to the well being of the infant ?

6 Give an account of the causes and treatment of rickets

7 What are the essentials every nurse should possess ?

8 A child complains of a sore throat—what steps do you take to find out what illness may be beginning ?

Advanced Examination for Nursery Nurses

SATURDAY MARCH 28TH 1936

Five Questions only to be Answered Time allowed—Two hours

1 Should an artificially fed baby fail to gain weight at a normal rate to what points would you pay special attention?

2 How would you render help to a child (1) with a burnt hand (2) in an attack of croup (3) with a bad cut at the wrist?

3 What do you know about rickets and what steps should be taken to prevent their development?

4 A child comes out in spots What points must you observe and consider to find out what illness might be beginning

5 Outline a twenty four hours programme for a healthy child of two years old—what good habits do you wish to encourage at this age?

6 Write an account of the qualities that make a good child nurse

Special Advanced Examination for Nursery Nurses

SATURDAY, SEPTEMBER 12TH 1936

Five Questions only to be Answered Time allowed—Two hours

1 *Why is ante natal care so important? How can it help in* improving the health of the race?

2 Give a brief account of the new duties that every baby has to learn after birth

3 Why should every baby be breast fed?

4 Give an account of the symptoms signs and treatment of rickets

5 How would you look after a premature baby during the first month of its life?

6 What dangers may arise from burns and scalds? How would you treat a case of extensive burns in a baby of six months?

Advanced Examination for Nursery Nurses

SATURDAY MARCH 20TH 1937

Question 1 *must* be answered and four others
Time allowed—Two hours

1 Why is sleep important to a baby? How would you establish good sleeping habits in a young infant and how much sleep does a baby need during its first year of life?

2 What substitutes for breast milk are available? Describe the preparation of a sample feed for a baby of three weeks of one of the substitutes you describe

3 How would you care for the skin of a baby who is liable to develop napkin rash?

4 Describe the preparations you would make to prepare for a premature baby

5 How would you attempt to deal with (*a*) the shy child (*b*) the child who tells lies?

6 What do you know of the emergency treatment of
(*a*) Falls on the head
(*b*) Drowning
(*c*) Dog Bites?

Advanced Examination for Nursery Nurses

SATURDAY, SEPTEMBER 11TH 1937

Five Questions only to be Answered Time allowed—Two hours

1 What are the signs and symptoms of an overfed baby? How would you prove that any particular baby was being overfed?

2 Give a brief description of a premature baby How would you treat such an infant?

3 What clothing would you put on a baby of six months
(1) In winter
(2) In summer
How much sleep and exercise should he require?

4 Give an account of vitamin C How would you make up any deficiency of this vitamin in the diet? What results might follow feeding without vitamin C?

5 What are the signs symptoms and treatment of Bronchitis?

6 What is the isolation period of
(1) Scarlet Fever
(2) Measles
(3) Mumps
(4) Chicken Pox
How would you disinfect after a case of Scarlet Fever?

Part II (Advanced) Examination

MARCH 26TH 1938

Question 1 *must* be answered and four other questions
Time allowed—Two hours

1 What common difficulties are met with in breast feeding? How can you help to avoid them and how would you deal with them when they occur?

2 What precautions would you take in the care of an artificially fed baby of five months during the hot period of an English summer?

3 What do you know about vitamins? Describe how you would take care that your charge receives sufficient of these materials

4 Describe how you would deal with
(*a*) Gravel rash on knees due to a fall
(*b*) Thrush.
(*c*) Scurf on head of infant

5 Describe your methods of looking after the (*a*) eyes (*b*) nose (*c*) mouth of an infant

6 What do you know about the underlying cause of bed wetting? Describe shortly how you would attempt to deal with it

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LONDON AND TONBRIDGE